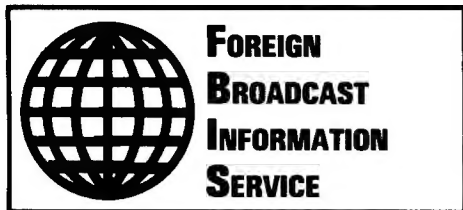


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6 OCTOBER 1992



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Science & Technology

***Central Eurasia:
Engineering & Equipment***

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Second Plutonium Producing Reactor Closed in Krasnoyarsk

927F0350 Moscow ITAR-TASS in English 0639 GMT 29 Sep 92

[Text] Krasnoyarsk September 29 TASS—Another nuclear reactor producing plutonium for military purposes was shut down at Krasnoyarsk nuclear enterprise on Tuesday.

The first reactor of this type was closed down this summer.

Both underground installations have been working in Krasnoyarsk for 30 years causing considerable pollution of the Yenisey River in which they discharged radioactive water from the cooling system.

Fifty years will be required to completely bury the reactors and scientists will have to monitor them for years to come.

The Krasnoyarsk enterprise is now planning to manufacture small reactors to generate heat and electricity in remote areas of northern Russia.

Past Achievements, Current Status, Future Prospects of Arzamas-16 Discussed

927F0277A Moscow PRAVDA in Russian 8 Aug 92 p 3

[Article by Igor Mosin: "In the Shadow of the Nuclear Bomb"; first paragraph is italic PRAVDA introduction, and final four paragraphs are italic PRAVDA postscript]

[Text] *Arzamas-16 is known to the whole world as the cradle of the Soviet nuclear weaponry. But today different winds are blowing over the world. And it has suddenly turned out that the very powerful scientific potential of Arzamas-16 has turned out to be out of step. Nuclear weaponry, as many politicians have stated, should pass into history. Let the scientists find peaceful ways of using their knowledge, experience, instruments, testing units, and the methods that they have developed. Is this really not a nobler goal? Who would dispute this today. There is more, of course....Here are some comments about how Arzamas-16 is trying to find its peaceful calling.*

The Secret of Department 13

"We are working on producing controlled thermonuclear fusion," said V. Punin, head of the laser department of the All-Union Scientific Research Institute of Experimental Physics of the Russian Federal Nuclear Center. "If we succeed in producing it, an azure dream of mankind will be fulfilled. People will have in their hands a practically inexhaustible energy source. But for now....For now, we are up to our eyeballs in shooting our targets."

The heart of the experimental thermonuclear unit on which the experiments are being conducted reminds one of a water bomb with numerous little jets. Through these little jets—there are 12 in all—laser beams aim toward

the center of the "bomb." They are directed at the targets—small glass balls filled with deuterium and tritium. The task is to compress the gas to a density of 100 g/cm³ and heat it to 30 million degrees.

These colossal densities and temperatures should, according to scientists' calculations, result in a thermonuclear reaction. In essence, they are trying on earth to reproduce processes occurring in the depths of stars. If one only considers the grandiose problems, goals, and tasks facing people! Our life is so strange and surprising—the stores are without basic detergent. Yet someone is trying to penetrate the secrets of the universe.

"The pulse principle," continues the scientist, "is the operating principle of our unit. That is, the lasers are switched on, and 12 beams are carried to the targets. The beams must compress them in order for the reaction to begin. We have already learned how to heat plasma to 100 million degrees. Things are not going as well with density. We are still only producing 1 g/cm³. In a word, we have as yet only met one condition needed for the reaction to begin. The lasers' power must be increased in order to reach the specified density. That is a complex problem."

I tour the building together with the scientists. It is a very complex structure in and of itself. It contains the most unusual and original engineering and scientific concepts. It is designed in the form of a cross. The length of one path along which the laser beam rushes to its nuclear target is 250 m. For each firing, 2,000 parameters are set. An average of two firings are conducted each week. The energy for the lasers is stored in capacitors that have been designed especially for these purposes. One pulse is equal in power to the Krasnoyarsk Hydroelectric Power Plant.

The building is a unique monument to high-precision geodesy. Because a small ball of deuterium and tritium must be compressed by laser beams with a high precision, the building must stand monumentally on its site. And indeed it is "alive"—it breathes, coughs, and reacts to subterranean vibrations. For this reason, about 500 marks are located in the building. Within a year they moved only half a millimeter. The entire unit was corrected accordingly.

But just why is the military involved in thermonuclear synthesis?

"I do not see anything strange in this," answered Valeriy Tikhonovich. "Nuclear power plants have grown out of units created for military purposes. It is no secret that many of our scientific innovations were used first in the defense sector and then in civilian life.

"Our Iskra-5, which is what the unit is called, appeared out of laser weaponry. Our developments in this region led entirely naturally to thermonuclear fusion. The first pulse was produced in 1989. We worked on creating the Iskra units for 30 years. Everything—from designing them to putting them into operation—cost 60 million

rubles. And now there are continuous problems with it. Unfortunately, it does not make sausage."

Our conversation led to sad thoughts. The Iskra-5 is the second most powerful unit of its type in the world. The Americans, French, and Japanese are persistently pushing toward the thermal nucleus. There was stability in the country, and there was certainty that work in this direction would continue. But today financing is provided on a quarterly basis, problems exist with the equipment, and our most skilled personnel are beginning to look elsewhere.

There are momentary tasks and tasks directed toward the future. The thermal nucleus is the future itself—mankind's tomorrow. After hearing the scientists, I felt anguish over the thought of what our tomorrow would be like if we spoil even the small foundation that our defense specialists have laid.

The Secret of the Explosion

Andrey Tarasov, my colleague from LITERATUR-NAYA GAZETA, turned out to be smarter than me. He quickly pressed the button when we were permitted, and an explosion rumbled behind the wall. From this very knob, I thought, runs one of the thousands of paths to the nuclear bomb.

In the chemistry and technology of explosives department they are busy developing one of the main components of the atom bomb—the explosives. And Doctor of Chemical Sciences Lyudmila Valentinovna Fomicheva, a likable energetic woman, is in charge of the entire project. A woman, nuclear bombs, explosives—there is something unusual in this.

"Why?" objects Lyudmila Valentinovna. "Chemistry requires patience, accuracy, and pedantry. There are therefore a great many female chemists. And to work with explosives, all these traits must be squared."

The department that Fomicheva heads is one of the most secret of the institute's subdepartments. Previously, before perestroika, the level of secrecy was so high that many in the city did not even guess its main purpose. When the test explosions resounded from the industrial zone and the children asked what was going on, their parents generally answered "They are pulling up hemp."

Now everyone, whether big or small, knows what this hemp was. And the explosive for the "hemp" is created under Lyudmila Valentinovna's supervision.

The theme of our conversation with her was, roughly speaking, the department's operation and conversion. Today the explosives experts must whirl around just to somehow earn their daily bread. It sounds preposterous that the creators of nuclear charges—people possessing the holiest of holy secrets of any government—are forced to look who knows where to sell who knows what more profitably.

"You understand," they explained, "that we make explosives with specified characteristics: antishock, antiradiation, frost resistant, refractory, and so on. The main problem for us now is to increase the safety of our product. Explosives like to be handled carefully."

As the specialists told it, [the thought of] working with explosives in civilian life plunges them into terror. In their opinion, they are still in the Stone Age. That is why there are so many accidents.

"Do you recall," says V. German, one of the department's associates, "that a railroad car filled with explosives exploded in Arzamas? I was the expert. The reason has yet to be established. But I expect that the standards set for loading explosives into railroad cars were the same as for loading cement into trucks."

The gap between the scientific level of military and civilian explosives is colossal. It is a field of plenty for conversion activity.

"Without a doubt," agreed L. Fomicheva, "only we, that is to say, our explosives, are worth a great deal. One must pay for quality. The public would prefer a cheaper price and more weight. This causes a great deal of trouble."

And so, albeit slowly and with a creak, the scientists have taken the first steps toward the application of their product for peaceful purposes. An order has come from Vietnam. A way of increasing oil recovery by using explosives had to be found. Within 3 weeks they developed and themselves manufactured 7,000 explosive perforators. They were sent to the Vietnamese free of charge. What did it matter that \$50,000 had to be spent just to transport these perforators by steamship. Where were the creators of nuclear weaponry to get this money. But it is a pity for the work.

V. Vasilenko, lead scientific associate in the department, laid ordinary-looking knitting needles out on the table. Their secret lay in the fact that they were stuffed with explosives. They have a very broad application area. These "needles" can, for example, shoot out the glass of a pilot's compartment in an emergency situation.

Here is another example. Railroad cars carrying sulfur have frozen solid somewhere in the South. There is no way to reach them. Again these accessories can help. The railroad car is wound most accurately with explosive cords and is demolished exactly according to a specified diagram. But the sulfur is intact—take it.

We have a normal level of work with our product. Vasilenko presented an astounding fact—1 failure in 10,000.

So that is how they have become accustomed to working here!

But no matter how much we talk about conversion matters, they must not in any way be separated from the basic problems with which the specialists are occupied.

And it is extremely useful to listen to the scientists who take your hand and talk picturesquely about a nuclear pulse.

They said that long years are needed to destroy nuclear weaponry. That is how it has been arranged. The current rush, the loud announcements regarding the problem bewilder the specialists. This is a case where if you rush, you will do so much damage that Chernobyl will not even compare with it.

Now, under the song of "conversion," everyone willing to take the trouble has been pouring into the defense sector. The new businessmen understand that their money is now paper. That is why they are rushing to invest in real enterprises, technologies, structures. But who and what stands behind these people? For whom will the defense sector's intellectual and industrial potential begin to work, and what will be the consequences of all this? It is entirely clear that no one is giving any thought to these problems. And they might have the saddest consequences. This is especially true if one is talking about weaponry representing an elevated risk.

It is time for everyone, they told me, to open their eyes and finally understand what real friendship and openness in the military area is and that what we are now being so fervently called upon to do never was and never will be. It is simply unnatural, immoral, and stupid. The Americans have been and are continuing to test their own nuclear charges while we rend our shirts and pledge them our eternal love and friendship. This is a circus, and we are playing the clowns.

"We have served the Fatherland honorably our entire lives," said the explosives experts in farewell. "That is how we were raised. And we will [continue to] serve it."

What the BIGH Is Keeping Silent

The BIGH is a fast burst reactor [FBR]. It is the most powerful in the world and the most unique from the standpoint of its design and capabilities. It is sincere when I say that I love such units. It is as if the human mind, inventiveness, talent, and if you like, man's incapable striving to understand the new are concentrated in them.

The BIGH was created for purely military purposes as one would expect at an institute such as this. It has helped in studying the effects of neutron and gamma-radiation on different materials. I recall that these types of radiation are formed during a nuclear explosion.

The BIGH is completely safe to operate. The principle of self-quenching has been incorporated into its design. It includes a number of other engineering solutions that pleasantly tickle one's pride—bright spirits still exist.

"The main virtue of this reactor," says laboratory head Mikhail Ivanovich Kuvshinov, "in our time of conversion lies in the fact that it is capable of simulating serious accidents at nuclear power plants. It can simulate what

would happen, let us say, if a nuclear power plant's reactor exploded and the radioactive rods were ejected. Instruments recording processes occurring over the course of minutes were in operation at Chernobyl. But what happened with fractions of a second needs to be tracked. Our methods make it possible to study all these processes."

The explosion of a nuclear bomb and a nuclear power plant share a great deal in common. The military has long studied the effect of different harmful factors on the environment, materials, and people. Methods of combating them have been developed. Indeed, that is why many of its [the military's] developments have spilled over into the whole program or the safety of nuclear power plant reactors. It is a most urgent problem that our scientists essentially have yet to begin studying. There is hope that the BIGH will prompt some solutions.

"Nuclear power plant safety," continues Mikhail Ivanovich, "will be a big undertaking for many long years. But the BIGH can be used in conducting a number of other extremely valuable experiments as well: investigating the effect of radiation on people's and animals' health, studying how the building qualities of many materials change under the effect of radiation, and a great deal more. Indeed, no one else has such a unit. Orders, financing, and confidence in the future are needed."

Wouldn't it be interesting to know what the BIGH itself rather than its masters think apropos of this humdrum of life?

The institute has its own conversion museum. The exhibits are well displayed there. As one of my acquaintances says, you can't hide talent. And it has appeared here.

The exhibits include a camera that photographs the flight of projectile and a small x-ray device that makes it possible to take a photograph directly, let us say, at the site of an event. Also included among the exhibits are original dosimeters and beds for burn patients, as well as something I would never have thought of, namely, clever tennis racket string stretchers.

But I listened to our museum guide's explanations with mixed feelings. Of course, all these things are necessary and good, and they should be developed. But why am I fooling myself? Our defense specialists cannot make a business of these things, and no matter how you look at it, they cannot feed them. But the main thing is that this is not their work—neither x-ray devices or tennis rackets.

The depths of the atom—yes, and the safety of nuclear power plants and nuclear weaponry, and yes too to the use of plutonium for peaceful purposes. Really, a microscope must not be used to hammer a nail. This is foolish. Only recently the simple thought "But will we ever understand this?" overpowers us increasingly frequently.

Kemerovo Leader Wants 1984 Nuclear Tests Claim Checked

*PM0708143992 Moscow Teleradiokompaniya
Ostankino Television First Program Network
in Russian 2000 GMT 5 Aug 92*

[From the "Novosti" newscast: Video report by M. Maksimovskaya, identified by caption]

[Text] [Video shows aerial shot of forests] [Maksimovskaya] Kemerovo Oblast Soviet Chairman Tuleyev has sent a cable to the Russian leadership asking them to check whether there were atomic explosions in the Kuzbass. According to his information nuclear tests were carried out in northern Kemerovo Oblast in 1984—needless to say, in total secrecy. However, it did not prove possible to keep secret the radioactive fallout that hit the Kuzbass following the tests. ITAR-TASS reports that the oblast's leadership is asking for an objective investigation to find out how serious the radiation situation is in the region. [Video shows archive footage of an explosion followed by a ground shot of the forest].

State Commission Assesses Nuclear Power Station Project

*LD3107215492 Moscow Teleradiokompaniya
Ostankino Television First Program Network
in Russian 1700 GMT 31 Jul 92*

[Video report by S. Sergeyev from Chelyabinsk oblast—from the "Novosti" newscast]

[Text] This is how the construction site of the Yuzhno-Uralsk nuclear electric power station [AES] looks today. Tall weeds everywhere and foundation ditches for the first and second power generating units are filled with water. We did not see a single worker or a single construction mechanism, therefore, rumors about reanimating a frozen nuclear installation turned out to be only rumors and the truth is as follows: A regular authoritative commission of experts, set up by the Russian Economics Ministry, has finished its work and reached a conclusion on the station project.

[V.I. Fetisov, director, "Mayak" Industrial Association, and Russian people's deputy] According to state experts, there are no obstacles to the construction of the Yuzhno-Uralsk nuclear station at present. The commission of experts noted that the decision to use a fast neutron reactor was very successful and that new prospects on the implementation of a closed nuclear fuel cycle are opened here, but to build or not to build the nuclear station—the decision should be made by the Russian Government, certainly, with the participation of the oblast soviet. [Video shows construction site, Fetisov being interviewed]

Ikram Kerimov; 'Military Is Controlling Earthquakes'; This Is the Discovery of the Azerbaydzhani Scientist

927F0284A Moscow TRUD in Russian 13 Aug 92 p 4

[Interview by T. Kasumov, correspondent for TRUD]

[Text] The mass "suicides" of sea life are caused by underground nuclear explosions. Professor Ikram Kerimov, deputy director of the republic's Academy of Sciences Geology Institute and doctor of physics and mathematical sciences, came to this, I'll tell you directly, startling conclusion.

The readers of TRUD no doubt remember our publication of the research findings of I. Kerimov on problems of earthquakes initiated by nuclear explosions. These findings were kept secret for many years, but were made public only last year after they had been declassified. At that time, it became known that as early as 1978, shortly after the earthquake in Gazli, it was precisely this Baku scientist who was the first to point out the connection between this catastrophe and the blasts at the Semipalatinsk site. He proposed that a repeat of the tremors could be expected soon in the years to come.

That is exactly what happened. Eight years after the first earthquake, a second one occurred in Gazli in 1984. This one was no less powerful. However, under different, "nonprovocational" conditions, the interval between them should have been no less than...10,000 years. Now I. Kerimov's conclusions on the impact of nuclear explosions on tectonic processes are receiving the widest dissemination in the scientific world. Previously, these conclusions seemed very improbable.

It took even less time to confirm another hypothesis of the scientist. There was a sharp increase in the level of seismic vibrations registered in Baku at the same time as the war began in the Persian Gulf. This led I. Kerimov to think that the Iraqi bombing activated the tectonic processes and will lead to a large earthquake in the broad vicinity in 1.5 to 2 years. Unfortunately, this forecast did not delay in coming true with powerful tremors in Georgia, Iran, Turkey and with many other less powerful ones.

TRUD: Ikram Gadzhievich, honestly speaking, there is not always enough time to keep up with your scientific ideas. Just recently in the republic's press you expressed the opinion that not only earthquakes, but typhoons and other atmospheric anomalies as well, can be caused by nuclear explosions. Now this very same circumstance is used by you to explain the mass beaching of dolphins and whales. Is there some kind of connection here?

Kerimov: A very direct connection. Although I admit that I myself noticed it only accidentally. My research on earthquakes caused by nuclear explosions led me to conclude a long time ago that even individual explosions can cause the most severe consequences. Not only does this involve a movement of the bowels of the Earth, but

landslides, cave-ins, floods and now, I believe, typhoons, hurricanes and tsunamis as well. Nonetheless, clearly bringing to light and demonstrating a similar connection has not yet been done successfully due to many factors, both natural and artificial. Suddenly, in a situation of relative calm, China conducted a powerful explosion in May. It seems virtually impossible not to take note of the consequences of such an explosion. Even non-specialists noted some of them, the most obvious ones. Reports are appearing in newspapers—you see how much the level of understanding of the problem has increased—that not only earthquakes, but mud slides, floods and cave-ins in Central Asia are a repercussion of the Chinese explosion. Now there are debates in the press about whether it is worth responding to this ecological intervention on the part of China. The deformation wave spread to the west and to the east and rolled all the way to us in the form of floods in Nakhichevan and Turkey, and to the American shore, in the form of earthquakes in California.

TRUD: One moment, Ikram Gadzhievich. So what you want to say is that all these natural disasters are also the outcome of the most recent explosion in China?

Kerimov: That is exactly what I want to say, as well as the seemingly inexplicable multitude of snowfalls in Dagestan and thunderstorms in Novosibirsk, earthquakes in Kazakhstan and Chita, and even typhoons which battered both the American and Asian shores of the Pacific Ocean. By the way, this also affected China, as well. There is particular confirmation for the latter supposition. I do not know whether anyone noticed that all of last year, when explosions were discontinued in Semipalatinsk, Murorua (France), Lob-Nore (China), and in Nevada, that the frequency of typhoons markedly decreased. There were practically no reports of typhoons and hurricanes. Is this simple coincidence? I think not. I see a similar correlation, which I repeat, is reliable, especially keeping in mind the powerfulness of the warhead exploded in China.

Well, I have recently been involved in singling out and systematizing anomalous phenomena in nature, by the way. They are those phenomenon which are powerful enough to be connected to the testing in China. On television one evening I saw scenes of whales which beached themselves on the Australian shore. Suddenly, I understood clearly that the apparently puzzling behavior of the animals, who "voluntarily" doomed themselves, might be the very same phenomenon. This seems so obvious that it is even odd that no one else had thought of this previously. The fact of the matter is that according to academician L. Brekhovskiy's discovery, special waveguide layers exist in a water medium. Within these layers acoustic waves spread for great distances without loss and remain intact for long periods. My discovery, which established the regularity of changes in seismic noises before earthquakes, whether they occur nearby or far away, confirmed the very same result, but only for a more complicated system—the lithosphere. It has been established that the generator of vibrations may be the explosion itself, as well as the

deformation wave caused by it. On the other hand, it is well known that the vector range of infralow frequencies is extremely dangerous, and in certain cases, for example at 7 Hz, life-threatening for man. It seems to me that it can be precisely for this reason that the whales are beaching themselves. The presence of these frequencies, which are pernicious to them in acoustic waves caused by nuclear explosions, can create such an unbearable environment, that it leaves them with no other way out.

TRUD: If this is so, then the mass death of starfish in the North Sea, which causes such alarm in the world, might be of the same ilk, since no other explanations have been found, despite examination by international experts?

Kerimov: That is not out of the question. However, more specific conclusions call for the comparison of a number of factors. One thing is incontrovertible: The current level of knowledge and experience allows a close correlation to be seen between cataclysms in nature and man's activities, primarily nuclear explosions, generated by the use of technology.

TRUD: At the same time, it is also clear that natural disasters and ecological catastrophes occurred on the Earth throughout all time and without the interference of man. How do you tie this in with your hypothesis?

Kerimov: There is no contradiction here. The earthquake in Georgia literally followed on the heels of increased seismic activity over a large territory with a radius of more than a thousand kilometers caused by the war in the Persian Gulf. Why in Georgia particularly? Why not in some other spot? For seismologists the answer is clear: This hot spot was the most "ripe" for the release. The Iraqi bombing only accelerated, and what is most alarming, intensified the ongoing process by giving it more destructive force.

Such a "reaction from the nether world" to an artificial influence was recorded frequently. The stronger it is, the more factors are at work. A classic example is the earthquake in Gazli. Nuclear explosions in conjunction with intensive natural gas mining not only led to an unbelievable reduction in the interval between the earthquakes for normal conditions. No less indicative is the fact that the strength of the tremors in both cases exceeded 7 points, although the Gazli region registered as a 4-point zone of seismic activity. Imagine to what extent the process is being "driven." If we previously thought that this only affected the lithosphere, then now, in light of the most recent observations, there is a basis to suppose that all other spheres respond in like manner, driving all existing trends to maximum strength. If we know this, then it is easy to understand why the lower temperatures predicted this summer for Dagestan due to testing in China turned into snowfall. In July in Novosibirsk they turned into thundershowers which exceeded the long-standing norms for precipitation.

TRUD: Nonetheless, Ikram Gadzhievich, it is not very clear why, let's say, a nuclear explosion causes such a

"perturbation" in nature, and natural earthquakes, which markedly exceed it in power, do not?

Kerimov: Without going into scientific details, the explanation is relatively simple. An earthquake is a natural process, whose energy is wound up in a relatively large region in all spheres.

If natural disasters are analyzed over a long period, it is easy to become convinced that they have never occurred as frequently as they have in the past 40-45 years—in the period of the nuclear standoff. Therefore, it is possible to assert that many destructive catastrophes in Central Asia, Iran and the Caucasus, beginning with the Ashkhabad earthquake, were provoked or accelerated and intensified by the explosion in Semipalatinsk. However, it is completely clear that testing at other sites affects the vicinities in a similar manner. When the arms race was averted, no one even suspected these consequences. When we understood them, we did not rush to share our sad discoveries. We placed military interests above those of all mankind.

It is precisely for this reason that it is imperative to immediately create an international commission for systematizing and studying all available data connected with induced catastrophes. Only in this way, by joint knowledge and efforts, can mankind and all that lives on the Earth be saved from this ultimate threat.

Norwegian-Russian Expedition To Search for Sunken Reactors

*92WN0723A Moscow IZVESTIYA in Russian
14 Aug 92 Morning Edition p 6*

[Article by Marat Zubko: "A Norwegian-Russian Expedition Sets Off for Novaya Zemlya"]

[Text] According to a report from the Norwegian telegraph agency NTB, a scientific expedition comprised of Norwegian and Russian experts is setting off for the island of Novaya Zemlya on Saturday, 15 August.

The expedition is starting from the Norwegian Arctic city of Kirkenes aboard a Russian vessel. It will be headed by Lars Feyn, a scientist from the Norwegian Institute of Marine Research. The experts have made it their goal to determine the burial sites of radioactive materials, their size, and the hypothetical threat to the environment.

According to information published in the Oslo newspaper AFTENPOSTEN, the Norwegian side possesses a map showing the locations where, in particular, 12 retired atomic reactors removed from Soviet submarines and icebreakers were sunk in the vicinity of Novaya Zemlya.

The newspaper asserts that this map was received from Russian colleagues by the so-called "Barents Sea Group," which contained representatives of the Norwegian foreign affairs and environmental ministries and

the radiation safety service. It recently returned from Russia. Judging from this map, the larger part of the sunken reactors are located east of Novaya Zemlya—that is, in the Kara Sea, but some are in the Barents Sea as well.

It is not difficult to surmise that confirmation of information that the USSR sank radioactive wastes in the seas (talk of this began long ago in the West) rocked the people of Norway, the economy of which depends to a considerable degree on fishing industry. Roald Setre, an expert from the Marine Research Institute, did hasten to reassure Norwegians, stating in the press that at the moment, there is no threat of contamination of fish populations in the Arctic Ocean.

"Measurements of the radioactivity of fish caught in Barents Sea," he affirmed, "showed that the radioactivity level is much below the norm established for food products after the Chernobyl Nuclear Power Plant accident." To put it specifically, it is 60 times below the norm, the expert said.

Nonetheless Norwegian fishermen and fish industry entrepreneurs demanded that an independent service be established in the country to regularly test the fishing banks for radioactivity.

The Norwegians are pursuing two goals here. First, they want to make sure that the fish they catch is uncontaminated (a significant part of their catch comes from northern waters). And second, Norway's fish processing factories depend to a considerable degree on deliveries of fish caught by Russian vessels. And inasmuch as it is difficult for Norwegians to verify the areas of the sea in which our fishermen are fishing, they wish to know the cleanliness of fish populations in the northern seas in general.

Ukase on Operating Authority for Nuclear Power Stations

*92SD0720A Moscow ROSSIYSKAYA GAZETA
in Russian 17 Sep 92 p 6*

[Ukase signed by B. Yeltsin, Russian Federation president, on the organization for the exploitation of nuclear power plants in the Russian Federation, No. 1055, dated 7 September 1992, Moscow, the Kremlin]

[Text] Taking into consideration the need for centralized state control of nuclear power stations and securing their safety in accordance with MAGATE [International Atomic Power Agency], I hereby decree:

1. It is established that the Russian state concern for electric and thermal energy at nuclear power plants (the Rosenergoatom Concern) is a state enterprise which, on its own and with the participation of other enterprises (organizations) performs the required functions during all stages of the operational cycle of nuclear power plants in terms of the choice of sites, design, construction,

commissioning, exploitation, termination of exploitation, and other functions of the exploiting organization.

2. It is established that the property of nuclear power plants—existing, under construction, planned, or mothballed (nuclear systems, fissionable substances, equipment, buildings, and installations which are part of the nuclear-power cycle)—and any other property used for the direct purpose of ensuring the functioning of nuclear power plants is federal property.

Within a period of one month the Russian government must ratify the list of said sites and properties used in the nuclear power industry.

3. In coordination with the Russian Federation Ministry of Atomic Energy, the Russian Federation State Committee for the Administration of Government Property, assign by contract to the Rosenergoatom Concern the right to full economic management of the following:

The federal property of nuclear power plants: existing, under construction, planned, or mothballed (nuclear systems, fissionable substances, equipment, buildings, and installations included in the nuclear-power cycle);

The federal property of state enterprises and organizations (as per the appendix) directly used in ensuring the functioning of nuclear power plants.

4. The local administrative authorities shall assign to the Rosenergoatom Concern land sectors within the boundaries of the safety protection zones of nuclear power plants with the right to open-end utilization.

5. It is established that the Rosenergoatom Concern is authorized to transfer on a contractual basis the federal property assigned to it along with the right to operative management of said nuclear power plants, enterprises, and organizations.

6. In signing the contract which assigns to the Rosenergoatom Concern the federal property, the Russian Federation State Committee for the Administration of State Property, coordinated with the Russian Federation Ministry for Nuclear Energy, will secure conditions for ensuring safety throughout all the stages of the active cycle of the nuclear power plants.

7. It is established that:

The Russian Federation State Committee for the Administration of State Property, coordinated with the Russian Federation Ministry for Nuclear Energy, will approve the statute of the Rosenergoatom Concern and the statutes of the nuclear power plants, enterprises, and organizations listed in item 3 of the present ukase;

On the instruction of the Russian Federation State Committee for the Administration of State Property, the Russian Federation Ministry for Nuclear Energy will conclude a contract with the head of the Rosenergoatom Concern and, on the presentation of the head of the

concern, with the managers of nuclear power plants, enterprises, and organizations listed in item 3 of the present ukase.

Data Cast Further Doubt on Radiation Safeguards

92WN0785A Moscow *ROSSIYSKAYA GAZETA*
in Russian 15 Sep 92 p 2

[Unattributed article: "Based on the Data of Gosatomnadzor [State Inspectorate for Nuclear Power: Nuclear and Radiation Safety of Russia"]

[Text]

Nuclear Power

Today there are nine nuclear electric power stations (AES) at work in the republic, where 28 power-generating units are operated with an installed capacity of more than 20 million kilowatts (including 12—of the VVER [water-moderated and water-cooled reactor] type, 11—of the RBMK [uranium-graphite channel-type reactor], and 5—with other types of reactors). The share of nuclear power in the energy supply of Russia comes to about 11 percent, moreover in the Northwest Region it accounts for 63 percent, in the Central Region—for 26 percent, and in the Middle Volga Region—for 18 percent.

During the first 6 months of 1992, 106 (as against 104 in 1991) violations of various sorts were registered at the AES of Russia. The greatest number of them (65 percent), confirmed by research reports, have been established at the power-generating units with pressure reservoir reactors of the VVER type, 30 percent—at pressure tube reactors of the RBMK type-1000 (Chernobyl type).

However, at the RBMK-1000 reactors in some cases the violations were accompanied by more serious consequences. Thus, for example, on 24 March at power-generating unit III of the Leningrad AES decompression of one of the working canals occurred due to the destruction of a multi-purpose valve, which led to the closing down of the discharge of coolant through this canal. The incident was accompanied by the emission of radioactive substances into the environment in excess of the established limits. This is the third case of dangerous damage of working canals in the practice of the operation of RBMK reactors. To exclude the repetition of such cases, the State Inspectorate for Nuclear Power, on the basis of materials of a commission of inquiry, has prescribed the replacement of the old model with canals of new design at all power-generating units.

In characterizing the state of the safety of nuclear stations on the whole, one should note their nonconformity with contemporary requirements of nuclear and radiation safety and the inadequate efforts of the Ministry of Nuclear Power of Russia in regard to the implementation of approved measures called upon to guarantee an increase in the level of their safety. The deadlines have frequently been postponed and at the present time there

is a lack of confidence in the full implementation of the necessary measures. As of today, not one of the operating nuclear stations has a procedurally complete basis of safety that includes conclusions about its state and an analysis of every possible consequence of the operation of the power-generating units.

For this reason, the State Inspectorate for Nuclear Power of Russia considers it necessary to adopt a State Program for the Use of Nuclear Power, which would include a part about the development of nuclear power engineering, as well as parts devoted to the reconstruction and withdrawal from operation of the existing power-generating units of the AES of the first generations.

Research and Industrial Reactors

During the first 6 months at five nuclear research reactors, three critical and eight sub-critical testing grounds subordinated to the State Inspectorate for Nuclear Power, accidents and violations of the conditions and limits of safe operation were not established.

In accordance with inspections conducted earlier and the decision of the presidium of the Moscow City Soviet, the State Inspectorate for Nuclear Power has issued an order for the stoppage of reactors of type MP and IR-8 of the Kurchatov Institute.

In April the collegium of the State Inspectorate for Nuclear Power adopted a decision on stopping the operation of two industrial reactors located at a mining and chemical combine of the Ministry of Nuclear Power of Russia (Krasnoyarsk-26), in connection with the pollution of the floodlands of the Yenisey River with radioactive waste. The first reactor was shut down in June, the withdrawal from operation of the second is scheduled for September of the current year.

Radiation Safety

According to the data of the State Inspectorate for Nuclear Power, more than 13,000 enterprises and organizations of the national economy of the republic use approximately 200,000 sources of ionizing radiation or work with radioactive waste. Here 130 research reactors, critical and subcritical testing grounds have been installed.

In connection with the broad use of sources of ionizing radiation (III) and technologies, as a result of which radioactive waste materials (RAO) are formed, the problems of the burial of radioactive waste and the uncontrolled spread of articles with radionuclide sources (IRI) acquire an increasingly acute character.

The inspections of the subordinated enterprises and organizations revealed the following characteristic violations of the radiation safety requirements: The lack or untimely reauthorization of the medical certificates for depositories of sources of ionizing radiation and premises designated for work with these sources; inadequate monitoring of the terms of validity of the certificates by

the territorial health and epidemic centers; the storage of radioactive waste and radioactive instruments that have not been used for a long time and do not have any prospects of being used; the lack of information of the places of burial of radioactive waste; the lack of radiation monitoring (this is characteristic of the MPS [Ministry of Industrial Construction]); the inadequate technical equipment of many enterprises and organizations with the means of radiation monitoring.

The most acute problem is the burial of radioactive waste. The specialized Radon Combine carries out the collection, transport, and burial of the radioactive waste that accumulates in enterprises and organizations. The chief problem here lies in the fact that the capacities of the regional depositories of Radom are filled almost to the limit.

In 1992 the burial of articles with radionuclide sources in a temporary "burial ground" was revealed. During an inspection of the Mosrentgen Plant (city of Vidnoye of Moscow Oblast), the burial of defective articles with radionuclide sources and polluted equipment with a total radioactivity of several thousand curies was discovered on its territory. The very fact of the existence of this burial ground (it is about 30 years old) is the most flagrant violation of the requirements of the NTD [scientific-technical documentation] known to the Ministry of Industry of Russia and the organs of Goskomsanepidnadzor [State Committee for Medical and Epidemic Supervision], which are not taking any measures for its elimination. The Gosatomnadzor [State Inspectorate for Nuclear Power] has proposed to the Ministry of Industry of Russia, Goskomsanepidnadzor of Russia, and the administration of the oblast to eliminate the burial ground.

Cases of the theft of sources of ionizing radiation have continued. For example, on 30 March, in a tie-impregnation plant in Volgograd, seven radionuclide sources of caesium-137, with a radioactivity each of 3.2 curies, were stolen; on 3 April, in the Turbodetal Production Association (city of Chelyabinsk), two heads of a gamma-ray flaw detector, containing sources of iridium-193 with a total radioactivity of 230 curies were lost. Cases of mass theft of sources of ionizing radiation have also been established. Thus, as the result of the flagrant violation of the requirements of scientific-technical documents pertaining to the registration and storage of radioactive substances, 150 educational sets of "Pluton" radio isotope sources were stolen from the warehouse of the educational collector in Irkutsk during 27-30 April. The radioactivity of every set is approximately 50 curies. 114 sets have been returned, the search for the remaining ones continues.

The potential danger of the uncontrolled spread of radionuclide articles is aggravated by the circumstance that, in connection with the reorganization and reduction in the number of military units, unaccounted-for instruments for various purposes, containing sources of ionizing radiation, are handed over by way of patronage

assistance to schools, vocational-technical schools, and other educational institutions. To bring them to light, the regional organs of the State Committee for the Supervision of Nuclear Power, jointly with the technical inspection of the Ministry of Education of Russia and the regional organs of Goskomsanepidnadzor of Russia have organized an audit of educational institutions.

On the whole, the state of radiation safety in Russia is an unsatisfactory one, although the facts cited cannot give a complete picture for its entire territory, since the work in regard to the exposure and registration of sources of ionizing radiation in enterprises and organizations not belonging to the system of the Ministry of Nuclear Power of Russia is not yet completed. The situation is aggravated by the general increase of the cost of the services of special combines and special washing machines, which will create the preconditions for the concealment and unsanctioned burial of radioactive waste.

In order to bring about a fundamental improvement of the radiation situation in the country, the speediest adoption of the State Program for the Treatment of Radioactive Waste is necessary.

Dismantling of Nuclear Subs Would Imperil Severodvinsk Environment

92WN0689B Moscow MOSCOW NEWS in English
No 28, 12-19 Jul 92 p 11

[Article by Lyudmila Zhukova, Severodvinsk: "We All Live Off a Yellow Submarine"]

[Text]

The situation in Severodvinsk following a presidential visit there.

An excerpt from Severodvinsk mayor, V. Lyskov's memorandum for the Russian Federation government:

"There are over 50 nuclear reactors on board submarines berthed inside the city, with the aggregate amount of radioactive materials 20 times greater than that in the crippled unit of the Chernobyl NPP. Over 1,000 potentially dangerous nuclear-related jobs—including the replacement of nuclear fuel in the submarines' reactors and putting the reactors in operation which creates a particularly precarious situation—are done within the city limits annually. Storage of eight decommissioned nuclear-powered submarines with still loaded nuclear cores poses another major problem. Some of the subs have been laid up here since 1975, which makes the probability of an accident rather high."

All the subs with missile sections cut out and nuclear cores already past the guaranteed safety age are in custody of the White Sea Naval Base and kept in store at the port which is next door to a residential area. The commander of the base, Rear Admiral Leonid Salnikov argues that the floating workshops' capacity is too low,

but the subs cannot be relocated elsewhere, since only Severodvinsk has the adequate equipment and experts for work with such subs.

In the meantime, the Northern Fleet continues to store obsolete nuclear-powered subs earmarked for recycling. The city will soon receive strategic subs of the Delta-1, Delta-2, and Delta-3 classes built in 1973-79. If the city's powerful (and Russia's only) plant code-named Zvyozdochka (starlet) capable of repairing, re-equipping and modernizing nuclear-powered submarines of all classes embarks on mass-scale carving up and utilization of the scrapped subs, this will gravely imperil the environment. According to U.S. data, carving up of a single Yankee-class sub will be accompanied by discharge into the atmosphere of 45 kilograms of manganese and chromium oxides apart from cobalt and lead.

Severodvinsk is a major builder of subs. The country's supreme naval command has always considered commissioning of every new sub a priority. Between 1967 and 1972, the Navy received 24 missile-carrying submarine strategic cruisers of the Yankee class alone. All were built at the Severny (Northern) Machine-Building Plant, at an astounding rate, unknown even in the United States.

It's time to bring a stop to it. Construction of just one nuclear-powered sub now costs four billion roubles on average. But the admirals have grown accustomed to receiving ever new subs for their fleets. A greed for more and more toys is understandable in a five year-old child but not in statesmen.

Boris Yeltsin's visit to Severodvinsk this spring brought the focus of public attention to the problems of that city. It was decided to turn it into a national centre of nuclear-powered shipbuilding. The city was promised it would be relieved of all headaches hampering fulfillment of this ambitious plan. Nevertheless, the problems continue to pile up.

Reliability Required From Reactors, Aircraft and Personnel! (Several Hours From President Leonid Kravchuk's Work Schedule in Context of Ukraine's Economic Prospects)

927F0252B Kiev DEMOKRATYCHNA UKRAYINA
in Ukrainian 13 Jun 92 pp 1, 2

[Article by Leonid Dayen, DEMOKRATYCHNA UKRAYINA economic observer]

[Text] 1. Should One Build Nuclear Plants?

The most experienced professionals with the highest authority in the nuclear power industry of the independent Ukraine—AES [nuclear power plant] managers and leading scientists— assembled in the hall. And this is understandable. The problem that had to be discussed— whether to develop the nuclear power industry—is too important in terms of its economic significance and at

the same time it is a delicate problem and is not simple from the psychological standpoint.

On one side of the scale was the bitter lesson and sad experience of our people, who had experienced the largest tragedy in the history of human civilization, the Chernobyl catastrophe. The catastrophe still reverberates as incurable pain in the hearts of millions. And how can one not understand their feelings and mentality, their resolute "No!" to "peaceful atom"?

On the other side of the scale is irreversible S&T progress, the economic logic of the modern civilized world. The example of France, which is close to Ukraine in terms of population and territory, has become a reading-book case—over 80 percent of electrical power there is generated at AESs. Add to this the current energy crisis and even the oil blockade of our young country, and you shall understand the urgency of the problem.

Life itself has put this problem on the agenda. And having sensed the demands and needs of the time, President L.M. Kravchuk decided to consult with professionals, hear out all "pros" and "cons", in order to clarify the attitude to nuclear power in a careful way, from the standpoint of scientific and economic justification rather than populist considerations. In this situation neither one can avoid taking into account the well-known Parliament resolution on the moratorium imposed on AES development in Ukraine.

And this is why the President asked each speaker to answer first of all the main question: "Should one build nuclear plants?" And when a business manager, having been carried away with numbers and the saga of purely pragmatic production problems, forgot to touch this key question, L. Kravchuk insistently reminded him about it. In this firm consistency one felt not a tribute to the chosen order of the conversation, but rather a statesman's craving and purely human desire to take into account the widest spectrum of opinions and assessments, so as not to make a mistake and to make the only possible decision. Because at stake are Ukraine's economic interest and her people's fate.

The speeches contained various nuances, warnings and approaches to the problem. But in the end everybody agreed on one thing - today there is no alternative to nuclear power. It is quite another thing that it must be based on a better technical foundation and be absolutely reliable and safe.

Well, such requirement is indeed mandatory. Although from time to time the single-valuedness in answers to the key question - "to be or not to be?" - reminded one the unanimity of the former times. Maybe this was due to the fact that in attendance in the hall were production people and scientists involved in that very nuclear power industry. One of them noted with a flavor of industry outrage that it is unacceptable to let public opinion be formed only by Yavorivsky. And somebody wanted to report in the gala style of the well-known traditions that his dear AES has reached world-class standards as far as

certain parameters are concerned. Yet another one tried to "press" the issue, stating that in the case of a negative decision he would retire.

But all in all the discussion of the "risk-benefit" subject turned out to be really businesslike, analytical and constructive. And the main thing, it was not just professional, but also humanly interested. The attention of those present was drawn to wall stands "Results of 5 Months of AES Operations", "Expected Commissioning Time of New AES Capacity Provided the Moratorium Is Repealed" and "Electric Power Generation Forecast in Ukraine Up to the Year 2005"... M. Umanets, president of concern "Ukratomenergoprom", analyzed the status and prospects of the nuclear power industry of the young country.

At present we have five operating nuclear plants - the Zaporizhzhya AES, where five one million kilowatt units are in operation and the sixth one is under construction; Pivdenno-Ukrayinska AES - three one million kilowatt units and one unit under construction; Khmelnytsk AES - one one million kilowatt unit and three units under construction; Rivno AES - one one million kilowatt unit, two 440,000 kilowatt units and one one million kilowatt unit under construction; and Chernobyl AES, where two one million kilowatt units are in operation and one unit has been stopped. It is planned to decommission the ChAES [Chernobyl AES] in 1993. To force this matter in 1992 is technically unsafe.

At present Ukraine's nuclear plants generate one-third, and in the winter up to 40 percent of all electrical power. It is impossible not to take these factors into consideration. Nobody wants to live without light and heat. But... Let us listen to the voice of the professionals.

Academician M. Pasichnyk: All reactors must be modernized. In the mean time there is still no concept of such modernization. The population will support us when there is safe nuclear power.

Academician V. Baryakhtar: Our AESs need automation and computerization. The most skilled personnel should be working there.

Zaporizhzhya AES Director V. Bronnykov: It is absolutely necessary to have a Nuclear Power Law. Not only deputies, but also lawyers and psychologists should take part in preparing it... A similar law in Germany is the most serious work.

Academician I. Yukhnovskyy: We have quite a few unprofitable energy-intensive industries. The economy must be reoriented structurally. It is necessary to reduce substantially consumption of electric power for product manufacturing.

Director of the Kharkyv Physico-Technical Institute Academician V. Zelenskyy characterized the situation very precisely and pointedly.

We are surrounded by countries with operating nuclear plants, and there is nowhere to run from this. Even if we

close all our AESs, the neighbors would still have them. So why seek a special and separate path? So much the more that nuclear power is ecologically cleaner than other types of power. But one should dispose of the industry's previous supersecretive stance. The latter dooms us to solitude and absence of business competition in the world.

The President expressed his satisfaction with the business discussion that took place at a statesmanlike level. He emphasized several paramount aspects. It is necessary to improve considerably management of the nuclear power industry. One shall not lock oneself only inside Ukraine and refuse to cooperate with other countries. And third, one should figure out how to break the psychology and overcome the population's fear of AES, the fear for the people themselves and for their children and grandchildren. Nuclear power cannot be commercialized and privatized. Competition of ideas - yes. But not decentralized control of such a specific industry.

2. One Should Build Airliners!

Whereas our compatriots can have different opinions as to whether to build nuclear power plant units, hardly anybody will dispute the need to build aircraft in Ukraine. But they must have the highest level of reliability and safety.

An hour and a half after the discussion with nuclear power industry professionals Leonid Kravchuk arrived at the Aircraft S&T Complex imeni O.K. Antonov. Such is President's tight work schedule. The visit with the creators of the most immaculate aircraft technology began not with office discussions, but with a shop visit. Leonid Makarovych came aboard aircraft AN-70T under construction and familiarized himself with the progress in construction of this firstling of the future aircraft series. General Designer P. Balabuyev told him that the new wide-body medium-size cargo plane is being developed to replace the air old-timer AN-12 for hauling a broad nomenclature of national economy freights. Compared to its predecessor the maximum load capacity of the new plane is higher by more than 50 percent, its cruising speed is 40 percent higher, and the range with a 20 metric tons load is longer tenfold.

Then the President visited the CAD room. Here, using high-class computers, the aircraft wing is designed. The new equipment had been purchased with money earned by KB [design bureau] "Ruslans", which operate on foreign commercial routes.

The objective of L.M. Kravchuk's visit to the ANTK [Aircraft S&T Complex] was to check the program of development of the aircraft industry of the independent Ukraine. The world-renowned design bureau, which was organized by Oleg Antonov in 1946, has created during this period over 100 types and modifications of various class aircraft for numerous applications. At present the collective, which at the time had given a start in life to air giants "Antey", "Ruslan" and "Mriya", is developing a gamut of new generation passenger, cargo-passenger and cargo planes. The program draft has been developed by

ANTK imeni O. Antonov in cooperation with the Ministry of Machine Building, Military-Industrial Complex and Conversion and Minoborony [Defense Ministry] of Ukraine, and leading aerospace industry enterprises - Kiev and Kharkyv production associations, Dnipropetrovsk "Pivdenmash" [Yuzhnyy mashinostroitelnyy zavod], Zaporizhzhya association "Motor-Sich" and design bureau "Progres".

The objective of the program: by efficient utilization of the available strong S&T potential satisfy Ukraine's own demand for aircraft technology and ensure that she enters the world market. Ministers and enterprise managers took part in the discussion. President approved the work that had been done and the industry's prospects.

"How natural is a situation", asked a DEMOKRATYCHNA UKRAYINA correspondent, "when on the other side of the fence from the KB imeni Antonov the Kiev Aircraft production association is getting ready for production of aircraft TU-334 developed at the Moscow KB imeni Tupolev, while projects developed by Kiev designers are being implemented in Russia?"

"This is how the former Union Ministry of Aviation Industry planned", P. Balabuyev answered. "Our Main Administration Head said: 'I have tossed Oleksiy Andriyovich Tupolev into his bed'. This means my bed."

"I think", quipped President, with everybody laughing, "we shall be able to make a replacement in the bed. This will give you creative inspiration..."

It is said that wings get stronger in flight.

Ukraine's wings are getting stronger.

Russia's Closed Cities

927F0241A Moscow NEZAVISIMAYA GAZETA
in Russian 30 Jun 92 p 5

[Article by Pavel Felgengauer on problem of concealed unemployment in closed city of Arzamas-16, other cities of nuclear archipelago, need for civilian control over ministry of atomic energy.]

[Text] Arzamas-16 and other closed cities and zones are becoming less and less secretive. Yet the special society burdened with excessive knowledge about the most efficient means of mass destruction has remained intact. It's uncontrolled breakdown may have severe consequences.

Reorganization: Capital of the Archipelago

Altogether, there are ten closed nuclear cities in Russia and all of them are under the jurisdiction of the Ministry of Atomic Energy (the former Sredmash). In the opinion of the present Atomic Energy Minister Viktor Mikhaylov, their population is roughly 700,000; in the opinion of the chairman of the Arzamas-16 city council, it is approximately 900,000. Arzamas-16 is the unofficial capital of the nuclear Archipelago (the former Sarov, the

city which was built at its time around the well-known monastery - the Sarov hermitage). In the spring of 1946, the future scientific leader of the All-Union Scientific Research Institute of Experimental Physics, Yuliy Khariton and the future VNIIEF director, Pavel Zernov arrived in Sarov and made the decision: to fence off the first secret nuclear zone right there. Thus the Soviet nuclear project began in earnest. Until that time, preliminary research had been conducted since 1943 in Moscow, at the "Laboratory Number 2" (the future Kurchatov Institute or "Kurchatnik").

Arzamas was selected because it was located in a remote corner of the backwoods, yet there was already a railroad access road leading there. In addition, the town already had a certain industrial infrastructure: an ordinance factory for which there was little need by 1946.

The total area of the restricted zone in Arzamas-16 is 260 sq km part of which belongs to the Nizhniy Novgorod oblast and part - to the Mordovian republic. As a matter of fact, neither the republic nor the oblast administrations ever had or have any influence on the affairs in the closed city. Even the early party secretaries. The town party committee was also truly fictional. Everything up to allocating land for garden plots was always decided in Moscow, at the department.

Arzamas-16 is purely a company town. Likewise, the most important man in town is the VNIIEF director (currently, it is Vladimir Belugin). Of the 81,000 inhabitants, approximately 24,000 work at VNIIEF which just recently was renamed as the "Russian Nuclear Center". Yet no more than a third of its staff are actually engaged in scientific and design work. The rest are either totally unrelated to developing new nuclear munitions (urban public transport, nurseries and much else belonging to the institute and serviced by its "staff") or are working at the pilot industry belonging to the institute, or in other purely technical jobs.

By the way, in the opinion of leading developers, no more than 200 of the best theoretical physicists who have managed to become truly versatile specialists during their years of work at the institute, as well as about 200 leading research designers are familiar with the entire nuclear weapons development process and are indeed capable, if they want to, of assisting nuclear weapons proliferation outside Russia.

The head of one of the theoretical departments at the VNIIEF explains the situation as follows: "We often laugh when we hear on TV an interview with the staff of the Kurchatov Institute in Moscow (and other 'civilian' physics institutes") saying that they are nuclear experts and that they may be invited to Third World countries to participate in nuclear programs. Not a single Soviet institution of higher learning trains specialists in our field. One must know not only nuclear (neutron) physics but also the gas dynamics, charge design, and special technologies. Every year we select several best students from the Moscow Engineering Physics Institute (MIFI)

for our department and then, 10-15 years later, they indeed may become experts. But in 1991, the students we selected refused to go to Arzamas. We are learning languages and are planning to work in the West. If this continues, by the year 2000 there will be no one left to work. We had two large-scale recruiting campaigns for specialists: in the early sixties and in the early seventies. Now these specialists are 50 and 60 years old respectively. And if the natural line of succession in transmitting our special knowledge is interrupted, then at the start of the next millennium there will be no true experts left. It will become impossible to develop new nuclear munitions. Worse yet the existing 'products' currently in stock will become unreliable and unsafe if the scientific level of our institute continues to decline".

In addition to Arzamas-16, nuclear weapons are also being designed in Chelyabinsk-70 which houses the All-Union Scientific Research Institute of Engineering Physics (Chelyabinsk-70 has a population of 40,000, 15,000 of whom work at the Institute; Vladimir Nechay is the institute director and Yevgeniy Avrorin is its chief scientist). The two scientific centers of the nuclear archipelago have rather close links: both formal in the scientific and production sphere as well as personal and social. Both Chelyabinsk-70 and Arzamas-16 have pilot nuclear warhead factories at the institutes; in addition, Arzamas houses the "Avangard Electromechanical Plant" (approximately 10,000 workers) which manufactures "conventional" and mass-produced "products". Now, by the way, the nuclear warheads to be retired are being dismantled at this plant.

Arzamas-16—the main city in the nuclear archipelago—is actually the most integrated of the closed cities: it is home to scientific research (including completely "open"), assembly of mass-produced and experimental warheads, and certain other "products" as well as (according to rumors) at least one nuclear reactor. The remaining nuclear cities are specialized industrial centers which taken together comprise the completed cycle of nuclear production. At one time, nuclear warhead assembly was purposefully set up in different regions to make it more difficult for the Americans to strike them with one hit by several missiles: Zlatoust-36, Sverdlovsk-45, Arzamas-16 and Penza-19 the smallest, the youngest, and until recently, the most mysterious town of the archipelago). In addition to an instrument making plant, Penza-19 is home to the Scientific Research and Design Institute of Radioelectronic Equipment (NIKIRET) yet as one can deduce from its name, it is primarily addressing applied issues in contrast to the "theoretical" issues addressed at VNIIEF and VNIITF. By the way, branches of the head institutes can be found in many cities.

Production of weapons grade uranium and plutonium was also scattered among different towns. Yet today, out of the 13 "plutonium" reactors in operation, only four remain in operation: one in Tomsk-7 and three in the underground Krasnoyarsk-26.

Khrushchev, a former miner, once ordered that an underground city be dug under the Yenisey knolls - integrated mining and chemical combine. The total length of the underground galleries is ten times that of the Moscow subway system. The residential neighborhoods of Krasnoyarsk-26 are on the surface while the production zones and the nuclear reactors are underground. Even today the "extractors" continue to extract plutonium at constant risk to their lives ("no matter what you do, you always 'dirty' yourself with radioactive dust") from spent "assemblies". It is asserted that existing "assembly" stocks will remain sufficient for a long time. "What else shall we do with them?" the local experts often ask (especially since it appears that there is still a state order for plutonium). At the same time, the ministry of atomic energy has suggested that a large part of the 400 million dollars allocated by the US Congress as assistance to the CIS be spent for dismantling nuclear weapons and developing a reliable store for the plutonium which will be removed from the dismantled warheads. By the way, the most probable siting of such a warehouse is the same Krasnoyarsk-26.

This year, two more underground reactors in Krasnoyarsk-26 are to be shut down, yet the last underground reactor in this wonderful city will probably remain operating for a long time since it generates not only plutonium, but also heat and electric power for Krasnoyarsk-26 (the world's sole underground nuclear power plant).

Not only plutonium and uranium are produced in the closed cities but also rare earth elements; precision instruments and many other "products" are created there - everything that the nuclear industry requires. By the way, the Sredmash precision instrument making capabilities are also used by certain kindred ministries: in the same Krasnoyarsk-26, military satellites are also being assembled underground.

The structure of the nuclear archipelago was developed and perfected over a span of more than 40 years - from the early romantic years when Khariton, Sakharov, and other remarkable scientists (under the general guidance of Lavrentiy Beriia) developed the Soviet nuclear bomb at the cost of enormous efforts and sacrifices to today's nearly perfect organization producing nuclear weapons. Then the trouble came in the second half of the eighties - perestroika. Thousands of nuclear specialists lost confidence in the future. And while a large part of "pure" production people is looking toward the future with a certain optimism (radioactive waste for Chelyabinsk-65 and Krasnoyarsk-26 will always be found in country and abroad; it will take a long time to dismantle tens of thousands of nuclear warheads on hand, while to adapt the components will provide work for assembly plants), designers and researchers are becoming increasingly desperate.

Nuclear Conversion: In Search of the "Peaceful" Atom

The nuclear industry has been producing far more than just nuclear warheads for a long time. Just as the entire

Soviet military-industrial complex (VPK), the Sredmash has generated a lot of "peaceful" production: rare earth elements, high purity substances, radioactive isotopes for scientific and medical purposes, electronic equipment for various purposes mostly using high-precision sensors, and, of course, nuclear power equipment well-known since the Chernobyl disaster. According to the minister, Viktor Mikhaylov, the volume of military work amounts to merely 14 percent of the turnover of the nuclear power ministry. In fact, these figures mean little since the market value of nuclear warheads is not known to anyone while the cost of production in the closed cities has never been properly taken into account.

All former Soviet enterprises and institutions harbor numerous superfluous workers (concealed unemployment) yet in the closed cities and especially in the "closed" science it seems that the situation is especially distressing. Security reasons made it impossible to fire the bad worker - it was easier to hire a new one. According to Vladimir Shchukin (the head of local administration in Chelyabinsk-70), 50 percent of the VNIITF staff are consummate shirkers: interested only in their salary (and not in scientific research). As a matter of fact, in military physics (in contrast to the rest of the Soviet science), most of the careers were made in large part, according to real and not imaginary merit. The nuclear "product" either explodes with a predicted yield, etc., or does not go off, and it is difficult to change or manipulate anything in this case. Yet, today warhead designers are attempting to find for themselves (and their institutes) a more or less "peaceful" application.

Back in 1988, when Arzamas-16 physicists, frustrated with Gorbachev's moratoriums on nuclear testing, saw their scientific careers ruined beyond repair due to the impossibility of staging the "ultimate" experiment, complete the work, defend a thesis, etc.; they suggested that underground nuclear explosions be used for simultaneously destroying and burying highly-toxic chemical compounds. The developers I spoke with at Arzamas-16 maintain that the chemical compounds disintegrate instantaneously in the shock wave front while the toxic elements, e.g., arsenic, and radioactive isotopes become forever buried, embedded in glass (1000 tons of mineral glass is formed during the underground explosion for every kiloton of the explosion energy on the TNT equivalent scale). At first, these studies were financed from the state budget but when the funds began to run out in the last budget, the Soviet-German Association "Chetek" which was hoping to play the role of commercial middle man picked up the tab: to conclude contracts, bring highly-toxic waste from abroad, and keep a certain percentage of the profits.

"Chetek" began a rather active advertising campaign offering a new waste utilization system and, we should add, was rather successful: the more than radical concept of destroying all kinds of trash ("bang-gone") as well as the fact that the nuclear explosions were to be organized by a hitherto unknown private company drew considerable attention to the project which, by the way, goes

against the Sredmash tradition. As a result of a somewhat one-sided discussion in the press and among the public, especially among the laymen, a generally negative attitude developed toward the idea of underground nuclear explosions with an additional highly toxic stuffing. (The developers - the physicists and designers from the VNIIEF were still in the compound writing their traditional confidential memos to the managers.)

A real test was thought to dispell any doubt. Preparations at the Semipalatinsk testing ground were proceeding full speed ahead. The explosion was scheduled for early September, 1991. To be sure, as well as in order to fully eliminate any possibility of failure, not one but five nuclear warheads were placed together in the shaft (if the first does not go off for some reason, then the second would be detonated, etc.). In fact, they assured me in Arzamas-16 that these safety measures were somewhat redundant; more likely, it was an additional security measure dictated by superstition: in more than 40 years of Soviet nuclear testing, there has been not a single case of total failure with stock-produced (not to be confused with experimental!) warheads - only up to 10 percent deviations from the expected yields have been recorded.

Yet the August putsch failed miserably, the Semipalatinsk testing ground was shut down (some say forever), and the hated nuclear moratorium was reintroduced again. Then the VNIIEF staff suggested that the highly-toxic chemical substances be destroyed with the help of an underground burst of fuel-air conventional explosives (VV) using existing technologies developed for the nuclear weapons (a lab-scale test of the explosion practices has already been completed). But of course, the efficiency of such a method is considerably less than earlier proposed nuclear disposal.

The VNIIEF experts are also suggesting a design of an underground (safe) nuclear uranium-thorium reactor (utilizing special drilling technologies developed for underground nuclear explosions). The designers and scientists from other nuclear cities also have many other original "commercial" ideas, yet, unfortunately, the result of the conversion efforts resembles the principle products of a given "company" or its certain component more often than not which substantially complicates its peaceful utilization. Furthermore, the inhabitants of these cities live behind barbed wire, so serious partners (especially from the West) often refuse to do business with such secretive "companies" which are still impossible to reach in most cases. Yet the residents of the towns, in turn, are fearful of strangers (and especially foreigners) and are almost unanimously opposed to opening the restricted areas. Nuclear Technologies (and Scientists) for Export

The western public in general and political leaders in particular are highly concerned by the possibility of the proliferation of nuclear materials and technologies from the collapsed Union. And they are even prepared to pay the Soviet physicists money to prevent them from immigrating to Third World countries.

As a result of the Baker-Genscher initiative, scientific centers will soon open in Moscow and Kiev which will be capable of dissuading the Soviet scientists from emigrating to Libya or Iran. Yet the problem is that Moscow (and especially Kiev) lack specialists in nuclear weapons. The military and "peaceful" nuclear physics almost completely parted their ways a long time ago: academician Velikhov and the physicists from Dubna and the Kurchatov Institute know nothing about nuclear weapons except for what they can find in any textbook (this is at least the opinion of the experts from the closed cities). In its today's form, the Baker-Genscher initiative can, indeed help (financially) some Soviet scientists yet it will not become an obstacle on the path of nuclear technology proliferation. The opposite is more likely - it may stimulate the emigration of the true nuclear (military) experts.

On 18-20 May, the first serious international conference on the closed cities was held in Stavanger, Norway; it was organized by the presently disbanded Russian State Committee on Defense Issues as well as by local Norwegian authorities. Representatives from all (!) ten closed cities arrived at the conference as well as the Russian Federation's Minister of Nuclear Power, Viktor Mikhaylov (who for many years worked at the VNIIEF) as well as an official representative of the "security" department, etc. For almost all of them, it was a first trip abroad in their lives: even the Minister Mikhaylov became "non-HAG" [Hazardous Activity Group] only a year and a half ago (at that time he was the deputy Sredmash Minister).

The meeting demonstrated that the outlook for successful conversion of the closed cities with western help is insignificant. Western scientists are prepared to cooperate with Moscow physicists from well-known institutes but not with unknown scientists from the closed cities who, to compound the problem, do not speak English. Furthermore, no one would want to start a joint research project when the security department may become involved at any moment and classify everything (and even order that the results produced be distorted to mislead the "western special services").

Yet not only the people are incompatible (this, in the end, can be corrected) but in many cases the technologies are incompatible.

In the long and arduous arms race, Soviet nuclear specialists not only did not fall behind their American colleagues - they largely overtook them, especially with respect to the number of warheads produced (altogether, more than 50,000 nuclear warheads were made of which 34,000 were transferred to the Defense Ministry and taken into service). Yet while the end result of the prolonged arms race did not differ too much (in principle) from the results in the United States, principally different technological and engineering paths for attaining it were often used. The Soviet Union has always been much poorer than the United States of America, so in the fields where the Americans could

afford to take the "straight" path, the Soviet scientists sought (and often found) cheaper "detour" technologies. (For example, Soviet warheads contain principally less plutonium while the Soviet enriched uranium is much cheaper than American.)

Now it becomes easier to understand the serious (by several fold) CIA error in estimating the capabilities of the Soviet economy and the total value of the gross national product. Upon close scrutiny, the best Soviet achievements in the areas of "high technologies" turn out to be composed of sufficiently "primitive" elements while the "civilian" production developed on their basis does not stand a serious chance of success in today's world market. Just as the Soviet engineering and design elite. For the same reason, some of the former Soviet experts may (potentially) cause a lot of harm if they end up working somewhere in Libya or Iran) they are trained to work under primitive conditions much better than their western colleagues and some of them are probably capable of assembling a nuclear warhead "from nothing", virtually "in their lap".

Maybe You Shouldn't Trouble Trouble Until Trouble Troubles You?

The reasons which constrain the nuclear technology proliferation today are diverse: a certain passivity of the reticent residents of the closed cities and the fear of the security department which became deeply ingrained in their psyche, the existing prohibition and limitations for travel abroad, the absence of serious contacts with foreign scientific centers, and maybe, most importantly - the patriotism which is rather prevalent among the residents of the closed cities. Yet to expect that all these factors will continue to remain as effective is unreasonable. The Baker-Genscher initiative may be quite harmful and the planned scientific center in Kiev may be especially dangerous - it may become the principal conduit for disseminating the prohibited know-how and technologies.

There were a lot of Jews in the first generation of the Soviet nuclear bomb designers yet after the ensuing years of personnel selection the closed cities are almost judenrein (as they told me in Arzamas-16 "only one scientific leader is left, the nuclear bomb developer Yuliy Khartiton"). Yet today, there is a new and numerous "foreign" nation in the closed scientific centers - the Ukrainians. Some scientists even told me that they are seriously planning on returning back home if Russia and Ukraine get a permanent "divorce". Yet the plans on setting up a scientific center in Kiev with western money may push many toward emigrating.

The subsequent fate of the aforementioned center is ambiguous: either with time it becomes the basis for developing Ukraine's own independent nuclear program or will turn into a certain scientific welfare program where good salaries will be paid for worthless reports (the existing scientific base in Ukraine is absolutely inadequate for conducting serious physical research). Of

course, many researchers and designers are interested primarily in their salary but not all and after failing to find applications for themselves in Ukraine, they may proceed further. Thus, for many (or let us say certain) carriers of the dangerous information, Ukraine may become a springboard into the Big World, a peculiar transfer point which will help them to overcome their complex of "treason" (only the first step is frightening).

The "Pamyat" society functionaries are also quite active in Arzamas-16. They are not too numerous and according to the physicists, these are primarily mathematicians who are distinguished, like Igor Shafarevich by ardent "anti-Zionism". Yet there are also physicists among them. There may be volunteers willing "to render fraternal help in developing an 'Arabic' nuclear bomb".

It would be better to leave the closed cities together with their dangerous secrets still closed, at least for the duration of the revolutionary chaos in the country. The existing security system looks impenetrable only from the outside ("barbed wire", plowed strips, etc.) yet in reality, it is extremely obsolete: since Lavrentiy Beriia's time, there have been no serious "punctures" in the Sredmash system and nobody has been seriously (rather than superficially) concerned about improving the "regime". Thus, there are no radiation counters at the checkpoints (KPP) (including the internal one installed in the production and research zones) in Arzamas-16. In principle, it is possible to take and carry out fissionable materials: no one has simply got an idea of engaging in this type of an enterprise. The physicist in Arzamas-16 maintain that the "security system is based largely on trust". The KGB counterintelligence continues to operate as it did before - the renaming and other perturbations have not resulted in any serious change "on location" either in personnel or in operations procedures. It is still based on agent work (an extensive network of "voluntary assistants"). And it is still operating more or less successfully.

(Only one female nuclear weapons developer has managed to leave the USSR and immigrate to Israel during the "stagnation" years. She resigned from the VNIIEF, remarried twice each time changing her name, and the KGB let her out when she applied for an exit visa.)

Yet if an accelerated decay of the closed societies in the secret cities begins, the counterintelligence may not be capable of maintaining control of the situation.

Of course, the nuclear power industry ministry needs "civilian" control, may be even more than the Ministry of Defense. The former Sredmash empire must be gradually reduced to a reasonable size which is more consistent with the decreased size of the state. The nuclear specialists are accustomed to an almost complete lack of control and certain bold projects probably need a serious public examination. For example, the pumping of liquid radioactive waste into "underground lenses carefully selected by the geologists" or the aforementioned suggestion to dispose of highly-toxic substances by means of

underground nuclear explosions. On the other hand, the need can push us toward realizing underground explosions in the nearest future: there are too many dangerous substances in the country for which there is no reliable storage nor are there tested disposal procedures (the vast supplies the "heptyl" liquid rocket propellant propose a special danger).

Generally speaking, former Sredmash enterprises will always remain busy: eliminating the vast supplies of already developed warheads, developing new the ones, testing the combat readiness of the existing weapons, etc. The problem of radioactive waste both, existing and those being constantly "produced" by the nuclear power plants remains unsolved - they are being simply "warehoused" under the Yenisey knolls in the underground caverns of Krasnoyarsk-26.

Russia will forever remain a "nuclear" state. Nuclear weapons saved Europe from World War III and there is no reason today to give up the world strategic nuclear parody - this will inevitably lead to new devastating wars.

Thus, in deciding the fate of the former Sredmash in general and the closed cities in particular, we must try to select the lesser of the two evils to the extent possible.

Color Televisions Instead of Plutonium for Weapons

927F0290B Moscow KRASNAYA ZVEZDA in Russian
14 Aug 92 p 2

[Text] Today, the first batch of Samsung colored televisions has been gathered together on the conveyor that was built at the Krasnoyarsk Mining and Chemical Combine. The enterprise, which was previously well-known as the producer of plutonium for weapons, has made a decisive step towards conversion. By the end of the year 12,000 televisions will be produced at the combine and by next year, 80,000 will be produced.

Country's Nuclear Shield Was Created by Many People

927F0290A Moscow KRASNAYA ZVEZDA in Russian
11 Aug 92 pp 1 & 2

[Discussion conducted by Nikolay Poroskov]

[Text]

Business Card

Yuliy Borisovich Khariton was born in 1908 in Petersburg. He graduated from the Leningrad Polytechnic Institute in 1925. Beginning in 1921, he worked in the Technical Physics Institute under the guidance of academician N.I. Semenov. From 1926-1928, he was sent to the E. Rutherford Cavendish Laboratory (Great Britain), where he received his Ph.D.

Beginning in 1931, he was at the Institute of Chemical Physics of the USSR Academy of Sciences and at other scientific research facilities. In 1939, in a joint effort, Khariton and Ya.B. Zel'dovich were the first to carry out the calculations for a chain reaction for fissioning uranium. Khariton directly participated in creating atomic weapons.

The academician is a three time Hero of Socialist Labor, a laureate of the Lenin and three State Prizes, an author of a number of fundamental works in the area of atomic energy and nuclear technology, and the founder and head of a new school on the theory of explosives. At the present time, he is the scientific director of the Russian Federation Nuclear Center of the All-Russian Scientific Research Institute of Power Physics.

Khariton is a whole era in science and the history of the country. Therefore, I nervously listened to the quiet voice at the other end of the line, in Arzamas-16: "Yes, I agree to talk with a correspondent from KRASNAYA ZVEZDA. Tell me when it will be convenient for you..."

Then approval was received from the Ministry of Atomic Energy of Russia to travel to the Nuclear Center. Suddenly, I find out that Khariton is in Moscow. Through his sister Anna Borisovna, I agree on a time for the meeting—the morning the next day in Novye Chermushki in the Moscow apartment of the academician.

KRASNAYA ZVEZDA: Yuliy Borisovich, at the conference on the history of the development of the first atomic weapons in April of this year, your colleague Vladimir Vzorov said: "If all publications consider Igor Vasil'evich Kurchatov the father of the nuclear shield, then it is time to say that the true father of the atomic shield was and always will be Yuliy Borisovich Khariton." This statement was published in many newspapers and became a type of sensation. We have not grown accustomed to the changes in the interpretation of history, especially in recent times, but...

Khariton: I cannot agree with such an assertion. The shield is a very complicated system. Creating it required organizational talent, which I, it seems to me, do not possess to a great enough extent. When, in my time, heading the development of the weapon was proposed to me, I said to L. Beria: Let Kurchatov be the director. This same proposal also originated with A. Ioffe. Time has shown that there were no mistakes. Igor Vasil'evich really possessed the great talent of an organizer. He had an excellent memory and was simply a charming individual. Between us there were warm, friendly relations. He died in my arms. At the time I was receiving treatment at the Barvikha sanatorium near Moscow. Igor Vasil'evich came to visit me. On a bench in the garden he talked animatedly about his forthcoming trip to France. He suddenly fell silent in the middle of a word, and slumped heavily against my shoulder.

Altogether the nuclear shield was created by many people.

KRASNAYA ZVEZDA: As far as I am aware, E. Rutherford, the author of atomic theory, did not believe to the day he died that nuclear energy would find a practical application. In 1934 he literally threw Leo Szilard out of his office. He had come to see him about the idea of a chain reaction. What caused physicists to continue their research?

Khariton: Sciences evolve. Some proposals and hypotheses that seem at first glance to be of little significance can fundamentally change the way you look at this or that phenomenon. I will tell you a little-known episode. In 1934 Ida Noddack, the German chemist and a great scientist, discovered a new element, rhenium, together with her husband. In the journal "Applied Chemistry" she wrote: Imagine that under the influence of a neutron on uranium, a neighboring element is not obtained, as was thought, but the nucleus decays into several pieces. As a chemist, she did not sense that as a result of electrostatic repulsion of the new atomic nuclei, a high amount of energy is formed. However, she wrote a phrase that in essence led to those things which had been expressed in January of 1989.

If a knowledgeable physicist read Noddack's article, work would have begun immediately. If this had reached the ears of physicists with a fascist bent, all world history might be a great deal more gloomy.

So what moves researchers? Scientific interest. There is an incomprehensible phenomenon which must be figured out, and this leads to collateral phenomena... You experience an unusual excitement and a boost of mental energy. Attacking a secret electrifies you.

KRASNAYA ZVEZDA: But, apparently, there are cases when it is not interest that motivates the scientist, but severe necessity. I think that is how it was when the atomic, and then the hydrogen bombs were created.

Khariton: Yes, academician Semenov wrote even before the war that we must get seriously involved in atomic weapons. So did Flerov. At first he wrote to Kaftanov, whose duties included involving science as much as possible in defense issues. He wrote to Stalin as well in 1942. The proposals sat neglected in the office work and were not responded to. Only information about the fact that the Americans were actively working on creating atomic weapons forced the government to alter its opinion.

KRASNAYA ZVEZDA: There is a widely disseminated opinion that the first Soviet atomic bomb was a copy of the first American one. You, if no one else, Yuliy Borisovich, can clarify the situation.

Khariton: For the past year or two there have been quite a number of articles in the press about this issue. Intelligence officers are writing very uncomplimentary things about scientists. However, there is one thing about which they are absolutely correct: Our first atomic bomb was a copy of the American one. At that time, I would have considered any other action unacceptable from the

national standpoint. The timelines were important: The one who possessed atomic weapons was the one who would dictate the political conditions.

KRASNAYA ZVEZDA: Who was the individual who passed over the plans of the bomb?

Khariton: Klaus Fuchs. After his trial, this incident became well known in the West. Without any special reason, it was kept a secret from us. Even in scientific circles it was not talked about.

Fuchs, about whom we did not know at the time, of course, did a great deed by accelerating the work. Of course, everything had to be checked and counted, since what was reported could have been skillful disinformation. In the end, we became convinced that everything was reliable and we reproduced the item. I repeat, we did not have the right to act any differently.

KRASNAYA ZVEZDA: Without Fuchs, would you have come to the same conclusion?

Khariton: Without question. There were ideas which needed to be perfected, however all of that required time.

KRASNAYA ZVEZDA: Allow me, Yuliy Borisovich, to ask the same question about priority, but only in reference to the hydrogen bomb.

Khariton: On one television program, if I am not mistaken it was on May 12 of this year, they stated that Soviet scientists did not accomplish anything themselves, but received everything from intelligence sources. This is completely untrue.

Hans Bette, the head of the theoretical department at Los Alamos writes that Edward Teller, who came up with the idea of the hydrogen bomb, was in despair from October 1950 to January 1951. Ulom, the Hungarian mathematician, had found serious mistakes in his work. The construction was postponed.

A portion of these erroneous materials, naturally, were received by us. Intelligence thought that we were using them. We were not. We had our own independent path to the hydrogen bomb.

KRASNAYA ZVEZDA: Who, then, can be considered its father?

Khariton: You know, this is a very complicated question. Andrei Sakharov played a great role, but he himself asserted that it was a collective effort, and Ya. Zel'dovich, Yu. Trutiev and a number of others made the greatest contribution (now Trutiev is my first deputy). The hydrogen bomb is an incredibly complicated thing. It was very hard to work with our poor mathematical and calculating equipment. However, nothing we received from intelligence sources was correct.

In 1952, the Americans conducted the first thermonuclear explosion. However, the device was too heavy to

lift—about 60 tons. They tested the current thermonuclear bomb on the surface of a Pacific atoll in 1954. The first thermonuclear bomb launched from an aircraft was ours. That was in 1955.

KRASNAYA ZVEZDA: Some scientists feel that the Chernobyl tragedy occurred because nuclear power stations were transferred over to less than competent individuals, who were not specialists in nuclear physics. In their opinion, nuclear physicists should take control of all power stations and the operation of the reactors. How reasonable is such a suggestion? In such a case, wouldn't scientists have to switch from science to the production of electrical energy?

Khariton: In their time, nuclear power plants were transferred from the Ministry of Medium Machinery Manufacture, where all the physicists were concentrated, to a different department. As a result, serious operating mistakes were made at the plants. Nonetheless, the majority of plants are operated without catastrophes. The nuclear power plants do not have to be handed over to the nuclear physicists. However, the physicists should not be allowed to devote less time to them. Physicists must be part of the staff of the plant.

KRASNAYA ZVEZDA: Great discoveries and inventions in specific cases have become a tragedy for mankind. Does science have any limits beyond which it becomes anti-science, where it turns against man?

Khariton: It is not science against man, but man against man. The natural sciences are knowledge of nature. You cannot say ahead of time, where the limits of science are. They can only be judged by the outcome.

KRASNAYA ZVEZDA: Edison had a horseshoe nailed to the wall of his office. When one of the scientist's colleagues expressed surprise ("Do you believe in omens?"), Edison answered something like this: They say that a horseshoe brings happiness no matter whether you believe in them or not. A shrewd answer. Do you believe, Yuliy Borisovich?

Khariton: No, I am not superstitious.

KRASNAYA ZVEZDA: No doubt you are also not religious. In my opinion, a scientist, like no other, recognizes the self-sufficiency of man, and therefore does not need religion. Or perhaps I am not correct?

Khariton: All my life I have been far from religion, I know so little about it. So where did nature come from? No one, not even astrophysicists can say to this day what the origins of the universe are. However, many always wanted to understand this. For those who believe in religion, this is a way to understand the universe and other phenomena and things of the like.

KRASNAYA ZVEZDA: You joined the CPSU in 1956. Are you still a Party member or have you left the Party? Perhaps a different political doctrine has attracted your attention?

Khariton: I am not a Party member. For a long time I had this feeling of believing in the Party, seemingly that the system was correct. For about 38 years I was a deputy of the Supreme Soviet of the USSR. Somehow I did not like capitalism.

KRASNAYA ZVEZDA: And now?

Khariton: To tell you honestly, I do not understand what is happening in the country. The Caucasus and Pridnestrov'e... This concerns me greatly. I did not have enough time to read much, but from what I have read, I cannot find a road for us to take.

KRASNAYA ZVEZDA: Obviously, the changes in the country's economy have affected the operation of the Nuclear Center. How does the conversion process affect you? To tell you the truth, I have difficulty imagining how to convert from the production of military equipment.

Khariton: Well, after all, you have traditional equipment and machine tools which need not only be used for basic production. There are some fairly good inventions in various areas: unique devices for medicine and ultra sensitive devices for determining infrared color... They are competitive and sometimes first-of-their-kind. However, organizationally, we are weak. We do not trade skillfully, nor earn much in doing so. I cannot say that nothing is being done. The money earned amounts to a sizable sum. However, we are not beginning to realize our potential. We must preserve people's backbones.

In the area of developments in defense, not much progress is being made. Laser devices for protecting aircraft from anti-aircraft missiles seemed promising. We made some good contacts, but things got confused and the design engineers had a difficult time with finances.

KRASNAYA ZVEZDA: The Americans and English are successfully developing capsules in which mini-thermonuclear explosions are being carried out. In essence, this is a prototype of a reactor of the future, which will replace coal and petroleum. Since we have discontinued nuclear testing, are we not behind?

Khariton: Of course, it would not be wise to discontinue explosions if the Americans are continuing them. This is first and foremost a question of safety.

We have long-standing ties with reactor specialists, and this will be to our benefit.

KRASNAYA ZVEZDA: During the disarmament process, large amounts of plutonium will be removed from warheads. Where can it find a worthwhile use?

Khariton: So far, there is no clear-cut concept of how to use plutonium in a positive manner. It is more dangerous to work with than, say, with enriched uranium. In my opinion, it would be best if the plutonium is stored and allowed to sit there than find a way to use it safely.

The Site as It Is

927F0330 Alma-Ata KAZAKHSTANSKAYA PRAVDA
in Russian 25 Jul 92 p 3

[Text] In recent years so much has already been written about the Semipalatinsk nuclear testing site, which was formerly a secret site in the territory of Kazakhstan, that it would seem that there is no point in writing any more. However, at the same time, very little has been written about it. That is because the theme of all previous publications was the same—the harmfulness of the site and nuclear testing, and the damage to nature and the population. That was as it should have been, since testing had to be stopped.

Finally, it came true. A decree of N. Nazarbaev, the President of Kazakhstan, prohibited nuclear testing at the site. The people breathed a sigh of relief. However, the site in and of itself still remains. The people who worked there still remain, as does immense territory and the scientific laboratories. Finally, the city of Kurchatov, the former Semipalatinsk-21, still remains, as well as a problem: Now what should be done with all this?

It was precisely this problem which was discussed at a meeting between managers of newspapers, radio and television and scientists, specialists and directors of the Semipalatinsk site and the "Luch" Scientific Production Association. The meeting was held on 14-16 July and was organized by the press service of the president of the republic, as well as the Kazakhstan Journalists' Union and the Kazakh State Corporation of Atomic Energy and Industry Enterprises (KATEP).

First of all, what the site is must be explained. Many of our readers have the erroneous impression that it is an immense piece of the republic's territory enclosed with barbed wire. They think that only nuclear testing was conducted there, that you can not drive or walk onto it and that it is very dangerous for your health to be there. Actually, the fact of the matter is somewhat different.

The territory of the test site is truly immense. A large "piece" of territory with a complicated shape was cut from the Semipalatinsk, Pavlodar and Karagandinsk regions. However, it is not out-of-the-way. The borders of this territory, as the borders of the majority of the countries of the CIS, have holes in them. There are "spots," so to speak, that are actually surrounded by "barbed wire" and guarded by soldiers. The remainder of the areas (of course, with permission from the military) are meadows, hayfields, and pastures. I must say right away (for the most cautious readers) that the level of radiation on these "open" territories of the test site do not exceed the values of the natural background. This does not come from the military. The journalists had the opportunity to check themselves. Each one had a personal dosimeter. The "closed" spots of territory are a different issue altogether. However, each one must be discussed separately.

"Test Field"

Each individual associates these words with something agrarian, like experimental plots, the cultivation of some agricultural crops... That is not at all how it is. Death was cultivated on these plots... This is the very same field where atmospheric and ground testing of nuclear devices was carried out until 1963. Here the level of radioactivity really does exceed background levels, but not everywhere, just in certain places. They are like small "spots" within a large "spot" on the test field (I repeat, the journalists did all the measurements themselves).

Somehow, the crater from the 1955 explosion of the first hydrogen bomb is not very impressive. It is small and overgrown with weeds. It seems that time heals even the most terrible wound of the earth. A greater impression is made by what was built here for the sake of the testing: pillboxes, log emplacements, concrete structures for the monitoring devices, railroad bridges, a portion of a "real" metro, and a "real" town with "real" houses (16 miles from the test site). Everything is warped, melted and crushed. Only the "metro" was left practically without a scratch, and some of the pillboxes remain standing. All the earth around the area (although it is already overgrown with steppe feather grass and fragrant wormwood) is covered with a layer made out of pieces of fused earth—cinders and glassy pieces.

The town has now been restored. People now live there (employees of the "Luch" Scientific Production Association). However, we saw a "top secret" documentary film about this explosion: the town was razed to the ground in the twinkling of an eye. By the way, what makes the strongest impression in the film is the destruction of civilian targets. When heavy tanks, airplanes and other military hardware fly up like little feathers, this is a strong impression, but somehow fitting. We have seen many such scenes in other films—bombings, explosions, and the very same warped equipment. But this is military hardware. It was created for war. It is supposed to explode and fly in all directions. However, when a two story house and all its contents "fly away" in a matter of seconds—that is something that the conscious does not want to accept. This is contrary to a normal human intellect. It is just like seeing a railroad grade with a break in it, where there used to be a bridge. Now there is not a trace, not a vestige...

"Degelen"

This is what the other "test area" is called. At one time there were low, but very beautiful mountains here. They say that before the nuclear era there were fantastic places here for shepherds to stop at. At one time, they say, Genghis Khan used to stop here. I do not know if this is true or not, but there are some extraordinary places here.

Now you would not know the mountains. The majority of the peaks now look like piles of rubble. I'll say. During an underground nuclear test (in this mountain range explosions were carried out in adits) the peak of the

mountain "jumped" about 4 meters in the air. Then it settled back down into that pile of rubble.

There are many such adits here. There are 127 to be exact. Each one is about a kilometer in length. The nuclear device is placed at the end of the adit. Then the adit itself is blocked up in several places with strong cement plugs. Measuring cables are laid out and then you have the explosion.

It takes about 8 months to build each adit. There is a special tunnel brigade to carry out this work. The work is pretty much the same as that for a shaft when the metro is being built, or tunnels for the Baykal-Amur railroad line. The wages here weren't bad. Before the market economy, tunnellers earned 7,000-8,000 per month. The adit itself cost about a million rubles in the prices of that time (not counting the nuclear device itself, nor the monitoring devices or conducting the tests).

We had the opportunity to be in one of them. The 190th adit is located almost in the very center of the Degelen mountain range. An underground nuclear test was carried out in this range in 1984. Now the adit has been taken off the long-term storage list and it is possible to go there.

We went almost from one end to the other, wearing hard hats and mining lamps. The adit disappears into the body of the mountain. It is perfectly horizontal and straight, without any turns. It is cold, dark and damp. In places on the walls, large spots of mold are turning white, like snow. The temperature is constant in winter and summer (as it is in any underground natural cave)—plus eight degrees. After the almost 42 degree heat on the surface, this is impressive. However, for some reason one does not want to build a restaurant here, as the now famous Colonel Petrushenko suggested at one time in one of his impassioned speeches. The dosimeters are cracking intensely, but the digital readings are well within tolerance range. By this time we are well acquainted with the numbers—those which are dangerous to your health and those which are not. So there is nothing to fear. Nonetheless, this is not the Novoafof cave. You want to get back out into the sunlight as soon as possible.

All of the adits are mainly for one-time use, like a disposable syringe. However, some of them have been used two or even three times after the appropriate geological research has been carried out. This is rare, by the way.

"Balapan"

One other test area of the site bears this endearing name, which is Kazakh for "chick". This is the area where underground explosions were carried out in bore holes, like in Nevada.

A bore hole also does not come cheap. They cost about a million rubles according to the old prices. They are drilled vertically, deep into the earth and are completely

packed with concrete and pebbles. They are approximately 500-600 meters deep. Only cables exit onto the surface. By the way, no matter how densely they are bunched together, a certain amount of gas still manages to escape from between the cables. Because of this, during the nuclear tests conducted recently before the ban was placed on nuclear testing (a result of the demands of society!), a special team approached the hole five minutes after the explosion. They chopped off all cables exiting on the ground and placed an additional concrete plug in the hole.

We journalists were interested in the following question: Why was testing nonetheless carried out in both adits and bore holes? What is the difference between them? The military explained it in the following way. Only small or medium-sized charges can be tested in adits. However, it is easier to follow the dynamics of the explosion and take measurements and conduct research (there are open spaces between the "plugs"). Any size charge may be tested in a bore hole (up to those permitted under threshold test ban international treaties). However, it is "muffled" (everything is packed with concrete and pebbles). It is more difficult to conduct a test under these conditions.

At "Balapan" the radioactive background is lower than on a "test field" or in an adit. It is almost that of the normal background.

Incidentally, there is the explosion which caused such a commotion a few years ago. Then, as you remember, a considerable portion of gas escaped onto the surface. The military called them noble gases. We were all disturbed: Maybe they also wanted to call them good for you? It turned out that we were all upset for nothing (not by the escape of gases, naturally, but by the name). This is simply a purely physical term: noble, as in inert gases (argon, krypton, and so on). The reason why they escaped to the surface is that the geological research was poorly conducted: a granite bed by the bore hole was inclined. It rose from the depths sideways, onto the surface. After the explosion the gases travelled along the crack of the bed and entered the atmosphere. By the way, the gases were also detected by the military, but not by a site worker, but by dosimetric monitoring carried out by one of the military units located in the region. That is how the scandal came out.

"Atomic" lake

There is one other sight to see at the test site. It is the "atomic" lake. During the sixties, one of the scientists got it into his head to try to build an artificial reservoir in the arid zones by using a nuclear explosion. It was decided to give it a try, for starters, on the test site. They dug about 150 meters deep into the earth and exploded the nuclear charge. Eight million cubic meters of earth were tossed into the air in all directions. This was in 1965.

A perfectly round crater, 500 meters is diameter was formed at the site of the explosion. It gradually filled up

with moisture from the underground strata and from melted waters. A lake formed. This is the very same lake in which Colonel Petrushenko took a bath (there practically wasn't one newspaper in the CIS that didn't carry this photo). Several journalists from our delegation decided to copy his "feat" (including the author of these lines).

I put the word "feat" in quotes because there is nothing heroic in this (except that each of us had to overcome the purely psychological barrier). The fact of the matter is that the very water in the crater does not contain any radioactivity. All the nuclear "dirt" is contained in the silt on the bottom (but at a depth of 100 meters) and in the soil, along the banks of the lake. This means that a more severe dose of radiation (not dangerous to your health, but simply a significant dose) was received by those people who stood on the bank, not those who took a swim. As far as Colonel Petrushenko is concerned, he only risked what anyone who took a swim in October is risking—catching a cold.

A Coal Open-Pit Mine

The "Yubileyny" coal open-pit mine has recently been operating at the test site. Two weeks ago "Kazakhstanskaya Pravda" wrote about it in detail. I can only add that the reserves of coal are enormous. The coal has a low ash content and high calorific value. Its only drawback is that it does not store well, but must be used right after it is off-loaded.

The Research Sector

The military has a fairly important laboratory-research base in Kurchatov on the test site. Impressive scientific research is being conducted here, as scientists throughout the world have recognized. This research is not only directed towards creating and improving nuclear weapons, but involves many areas, including seismology, medicine, and meteorology. I think that it is precisely this unique scientific base which must not only be preserved by us after the test site is closed, but should be developed further for the good of the republic.

"Luch" Scientific Production Association

In addition to the military, there is one other large scientific division. It is the "Luch" Scientific Production Association. Previously, it was subordinated to Moscow. Now it is part of the Kazakhstan National Nuclear Center.

It is often confused with the test site, and wrongly so. The "Luch" Scientific Production Association only happens to be located on the territory of the test site. It conducted research on specific issues associated with nuclear weapons. Mostly, their time was spent on completely different problems, such as safety in the nuclear energy industry, creating a nuclear jet engine and other similar issues.

The research base of the "Luch" Scientific Production Association is located on the territory of the test site and includes a bench test facility called "Baykal-1," at which two research nuclear reactors are located. They are the IVG.1M and the RA. There is also a bench test facility for the IGR reactor. The IGR reactor is a pulsed, collision-graphite, self-quenching, graphite-moderated, reflected thermal reactor of the thermal conduction type. However, these are specifications for specialists. It can be explained more simply in the following way. The reactor looks like a piece of masonry made up of graphite blocks which contain uranium and which are organized in columns. The reactor reflector is made out of similar blocks, which do not contain uranium. The structure contains rods of the reactor control and protection system and experimental channels in which to place the objects being tested. This whole structure is enclosed in a containment vessel filled with helium. This is placed in the reactor water shutdown cooling tank.

This is a unique reactor. There are none like it throughout the world. It is based on the concept of I. V. Kurchatov. The greatness of his concept lies not only in the fact that almost any type of research can be carried out on the reactor in the "burst" and "pulsed" modes, but the fact that it is "self-quenching." Even if all the safety rods were removed from the reactor, it will quench the build up of the nuclear reaction itself. The reactor has been operated since 1961. At first, it was called DOU-3—"before the third stroke". Previously, Kurchatov had two heart attacks, but he managed to build his unique facility before the third. Those physicists do joke... The operating personnel and scientists live in the very same experimental housing which was destroyed during the testing of the first hydrogen bomb, and then restored.

The IVG.1M is a research light water, heterogeneous, pressure-type thermal reactor with a beryllium neutron reflector. But again, these are specifications for specialists. The reactor has been operating since 1975. It is located underground, along with everything that is associated with the reactor. In essence, it is a small underground city which contains everything necessary for life support and even short-term self-sufficiency.

The RA reactor is located right next to this city. It is also a research, high-temperature gas-cooled, pressure vessel thermal reactor with gas coolant, zirconium hydride moderator and beryllium reflector. For us, the non-specialists in nuclear physics, it was the most interesting, since it was the very nuclear jet engine created in the seventies and adapted for unnamed reasons for research purposes. It has been operated as a reactor since 1987.

The core of the reactor is the size of a bucket (forgive me for the comparison, physicists). As a whole, the engine is the size of a gasoline barrel. If the principle of its operation (as a nuclear engine) were to be explained simply, it would be the following: hydrogen is heated by a nuclear reaction until it reaches 3,000 degrees (low temperature plasma) and is expelled in the form of a jet stream through a nozzle. Naturally, such an engine on a

space ship can only be switched on in space. To achieve near earth orbit, the space ship must run on the typical, existing jet engines.

The research reactors of the "Luch" Scientific Production Association have a number of special safety features for the experiments conducted on them.

- They are located on the test site and have a medical protective zone with a radius of 50 kilometers. This guarantees the safety of the population in the surrounding regions;
- They are characterized by low amounts of operating time to produce fission products in the core (the operating mode is such that it takes weeks to prepare the experiment, and then the reactor operates only minutes, or even seconds). In this way, serious radioactive pollution to the environment is eliminated, to all intents and purposes, even if a hypothetical accident occurs and the reactor is totally destroyed.
- The presence of special underground structures, safety bunkers and underground pedestrian walkways, the distancing of the control panels (up to 500 meters) from the reactors, and a number of other measures which provide for effective protection of the personnel.

This distinguishes, in a favorable way, the reactors of the "Luch" Scientific Production Association from other research reactors in the country. It is also a serious argument for creating an experimental center here to conduct reactor research in the area of safety in the nuclear power industry.

For example, this is what the specialists of the American firms Aerojet and Babcock & Wilcox had to say about what they saw at the "Luch" Scientific Production Association, which they recently visited: "The unique installations of the 'Luch' Scientific Production Association have such potential, that you can not find their like anywhere in the world today. The demonstrated capability to create and test fuel assemblies at temperatures exceeding 3,000 degrees Kelvin in hydrogen confirms that Kazakhstan and its partners in Russian can be proud of this. Having visited your experimental areas, we were convinced that their experimental potential is enough to provide the fundamental developments of a YaRL reactor (nuclear jet engine—V. S.) and substantiate the possibility of meeting the requirements set for nuclear reactors as they relate to safety and a successful flight to Mars."

The specialists who gave this conclusion are used to taking care of their good names and do not give empty praise. Apparently, the parliament and government of our republic should listen to their assessment. Especially since we must not only find the means to support the

whole experimental base of the former test site in operating order. For the experiments which are being conducted we are being paid (a considerable amount) by both foreign countries, as well as interested countries of the CIS.

There is something to think about.

Yenisey Radiation Levels Detailed

92WN0701A Moscow ZELENYI MIR in Russian
No 19-20, May 92 pp 6-7

[Unattributed report: "Nuclear Trail of Yenisey"]

[Text] Radiation levels in the Yenisey River from Krasnoyarsk to Igarka were studied in August-September 1990 as part of the comprehensive program of environmental impact evaluations in Krasnoyarsk Kray.

More than 200 samples were taken and analyzed in over 20 locations.

The sites were chosen with the aid of aerial gamma-radiation surveys indicating the sections with the highest gamma field readings.

Samples were taken and analyzed according to the standard procedures of the State Committee for Hydrometeorology. All of the field studies were conducted on the specially-equipped boat "Myatezhnyy."

The presence of natural radionuclides in the Yenisey River is the result of sewage from the mineral chemical combine. Studies of the impact of sewage on the level of radioactive pollution in the river included the selection and analysis of water, sediment, and algae samples and fish in certain sections.

The underwater outlet for the sewage from the combine is located 50-100 meters from the right bank of the Yenisey. At the time of the studies, the level of gamma-emitting nuclides at a depth of 0.5 meters in the zone where the sewage converged with the river water had reached 3,000 mcr/hr. The fact that the sewage was discharged near the right bank was the reason for the higher pollution levels in the right half of the channel and coastal zone for a fairly long distance, almost all the way to Strelka. After the point where the Yenisey merges with the Angara River, the cleaner water of the Angara forces the Yenisey water toward the left bank.

In the first 20 kilometers from the outlet, the force of the radionuclide dose is diminished by a factor of 150 as a result of disintegration and diffusion. The subsequent reduction of the gamma field is more even.

The figures in Table 1 are calculations of the concentration of the most significant nuclides and the level of beta-activity in the water, based on the analysis of the test samples.

Table 1. Concentration of Radionuclides in Water of Yenisey River, Curie/liter

Sample location and distance from discharge site	Concentration, C/l											
	Mn ⁵⁶	Na ²⁴	As ⁷⁶	Np ²³⁹	Cr ⁵¹	Zn ⁶⁵	Co ⁵⁶	Co ⁶⁰	Cs ¹³⁷	Fe ⁵⁹	Mn ⁵⁴	beta
Tartat Bay, 10 km up river	—	—	—	—	—	—	—	—	—	—	—	—
Discharge site, 0 km	4.0-8	1.0-7	2.5-9	5.0-9	5.5-9	5.0-11	1.2-10	8.0-12	2.5-11	5.0-11	2.5-11	5.1-7
Atamanovo, 6 km	3.0-9	2.1-8	3.0-10	1.0-9	9.1-10	5.0-12	1.4-11	—	5.0-12	8.8-12	4.8-12	4.7-8
Bolshoy Balchug, 16 km	7.0-10	3.5-9	7.6-11	5.1-10	2.0-10	2.1-12	3.7-12	—	—	—	—	5.9-9
Kononovo, 25 km	3.3-10	3.1-9	6.5-11	1.5-10	1.6-10	—	—	—	—	—	—	4.3-9
Pavlovshchina, 57 km	—	9.3-10	2.6-11	7.0-11	8.4-11	—	—	—	—	—	—	1.5-9
Yukseyevo, 78 km	—	7.0-10	8.0-12	—	1.5-10	—	—	—	—	—	—	1.0-9
Strelka, 249 km	—	1.1-10	—	—	7.5-11	—	—	—	—	—	—	—

Notes: 1. These are the total concentrations of filtration and suspension; 2. The dash indicates that the concentration of this radionuclide in the sample was below the level measurable by this method, constituting 2-12 C/l; 3. The radionuclide concentration figures in the table should be read as follows: 4.0-8 signifies 4.0×10^{-8} C/l; 8.0-12 signifies 8.0×10^{-12} , and so forth.

Soil samples were taken from the areas below the high-water mark for the last 30 years. Table 2 indicates the radioactive pollution of this zone is apparent all the way from the site where the radioactive substances were dumped to Igarka.

Table 2. Radioactive Pollution of Yenisey Floodplain

Sample location and distance from dump site	Sample code	Soil pollution density, C/km ²										MED, mcr/hr		
		Mn ⁵⁴	Co ⁶⁰	Zn ⁶⁵	Cs ¹³⁴	C ¹³⁷	Ce ¹⁴⁴	Eu ¹⁵²	Eu ¹⁵⁴	Eu ¹⁵⁵	Total	K-40	H-0m	H-1m
Tartat, 10 km up river	6-r	—	—	—	—	0.03	—	—	—	—	0.03	2.00	11	12
	9-l ₁	—	—	—	—	0.06	—	—	—	—	0.06	—	14	13
	13-l	—	—	—	—	0.15	—	—	—	—	0.15	2.30	14	13
Atamanovo, 6 km down river	17-r	0.28	1.61	0.33	0.02	0.58	—	3.13	1.01	1.41	8.37	0.53	90	55
	18-r	0.23	2.33	0.36	0.18	5.51	0.18	3.04	1.82	3.72	17.37	0.54	53	30
	19-r	1.85	1.42	2.00	0.49	2.72	—	11.02	3.91	8.11	31.52	3.71	93	70
	20-i	1.51	12.04	1.81	0.21	4.44	1.82	12.01	4.83	2.43	41.10	2.72	197	136
	23-l	—	—	—	—	0.03	—	—	—	—	0.03	1.22	13	11
	24-i	0.16	2.20	—	0.09	3.03	0.64	2.13	—	—	8.25	2.40	59	49

Table 2. Radioactive Pollution of Yenisey Floodplain (Continued)

Sample location and distance from dump site	Sample code	Soil pollution density, C/km ²										MED, mcr/hr		
		Mn ⁵⁴	Co ⁶⁰	Zn ⁶⁵	Cs ¹³⁴	C ¹³⁷	Ce ¹⁴⁴	Eu ¹⁵²	Eu ¹⁵⁴	Eu ¹⁵⁵	Total	K-40	H-0m	H-1m
Bolshoy Balchug, 16 km	25-i	—	1.02	—	—	2.82	—	1.72	—	—	5.56	2.44	41	36
	26-i	0.22	2.81	0.15	0.07	1.33	0.73	1.81	0.37	—	7.49	3.41	56	48
	27-r	0.05	1.83	0.14	0.05	0.83	—	1.85	0.35	0.79	5.89	0.77	48	42
	29-r	0.37	2.72	0.38	—	2.02	0.16	5.30	2.30	3.80	17.05	0.90	78	48
Kononovo, 25 km	33-l	—	0.13	—	—	0.26	—	0.35	—	—	0.74	2.40	14	15
	34-l	—	—	—	—	0.07	—	—	—	—	0.07	2.64	12	12
	36-r	0.06	0.61	0.15	0.02	0.67	0.28	0.41	—	0.21	2.41	0.77	26	36
	37-r	0.11	1.62	0.05	—	3.41	—	1.51	0.23	—	6.93	1.82	54	40
	74-77-l	0.75	2.27	0.47	0.09	3.42	1.13	1.87	0.23	0.56	10.79	2.36	59	42
Strelka, 249 km	78-i	—	1.32	0.25	—	1.41	—	1.16	1.11	—	5.25	2.30	36	27
	79-r	0.18	0.75	—	0.06	1.96	2.23	0.58	—	—	5.76	1.13	30	21
	83-i	0.63	1.92	0.34	—	1.73	0.68	1.33	0.26	—	6.89	2.74	67	44
Lesosibirsk, 290 km	85-l	—	—	—	—	—	—	—	—	—	—	2.58	18	15
	87-i	—	—	—	—	0.07	—	—	—	—	0.07	3.62	12	13
	88-r	—	—	—	—	0.01	—	—	—	—	0.01	1.42	12	10
Igarka, 1,667 km	112-r	—	0.01	—	—	0.10	—	—	—	—	0.11	1.52	12	12
	113-l	—	0.01	—	—	0.04	—	—	—	—	0.05	1.83	15	12

Notes: The dash signifies a figure below the level measurable by this method; the letters in the sample codes signify: r—right bank, l—left bank, i— island.

Whereas the soil close to the source is polluted mainly by nine gamma-emitting nuclides—Cesium-137 and 134; Cobalt-60; Manganese-54; Zinc-65; Europium-152, 154, and 155; and Cerium-144—there are only two long-lived nuclides farther on, 500 kilometers from the source—Cesium-137 and Cobalt-60—that fall within the measurable limits of this testing procedure.

The location of the source of the RS (radioactive substances) resulted in the pollution of the right bank of the river virtually from the dumping site on. Pollution levels on the left bank become measurable at 50 kilometers from the dumping site.

The maximum density reading of soil pollution by all of the test nuclides was 41 C/km² (on Atamanovskiy Island,

6 kilometers from the RS discharge site). The MED in this location was 136 mcr/hr. Pollution levels in the different sections were extremely uneven, and at a distance of more than 25 kilometers from the RS dumping site they were almost unaffected by the distance from the source and were dependent on the hydrological parameters of the river, especially by flooding, which stirs up the bottom sediments, where the nuclides accumulate, and redeposits them in the floodplain and on islands.

At distances of 25-500 kilometers from the source, the maximum levels of radioactive soil pollutants ranged from 3 C/km² to 10 C/km².

The data in Table 3 indicate the pollution levels of floodplain soil and bottom sediments by the most dangerous plutonium and strontium nuclides.

Table 3. Plutonium and Strontium Content in Soil of Floodplain and Bottom Sediments

Sample location and description of sample	Concentration, kC/kg			Pollution density, mC/km ²		
	Pu ²³⁸	Pu ^{239,240}	Sr ⁹⁰	Pu ²³⁸	Pu ^{239,240}	Sr ⁹⁰
1 km down river from combine dump site, sediment	0.15	0.22	140	12	18	13,900
Atamanovo, 6 km, right bank, sediment	0.035	0.1	—	3	11	
Atamanovo, Atamanovskiy Island, 6 km, soil	0.11	0.23	—	23	47	
Predivinsk, 97 km, soil	0.02	0.08	—	3	15	
Strelka, 250 km, Ust-Tungus Island, soil	0.06	0.14	—	9	22	

Notes: The concentration of plutonium is calculated with the air-dried weight of the samples; the dashes indicate figures below the level measurable with this method (under 15 kC/kg).

The level of these nuclides in the soil is five times as high as in the sediment in the same section of the river and dozens of times as high as the global level of pollution.

The studies indicated the following:

1. The radioactive pollution of the Yenisey River and its floodplain was caused by sewage from the mineral chemical combine.

The river is polluted for more than 800 kilometers from the source and the floodplain is polluted for up to 1,500 kilometers down river from the dumping site.

2. The dumping of the combine's sewage near the right bank is the reason for the higher pollution levels in the right half of the channel for a distance of 250 kilometers and the right bank of the river for a distance of 50 kilometers from the dumping site.

3. The exposure dose of gamma radiation in the water at the center of the radioactive flow in the discharge site was 3,000 mcr/hr at the time of the study, and the figure at a distance of 20 kilometers was reduced by a factor of 150 by the diffusion of the flow and the disintegration of short-lived nuclides.

4. The highest level of radioactive pollution in the bottom sediment was recorded in the part of the river running from the dumping site to Bolshoy Balchug. At a distance of one kilometer from the site, the pollution levels were 35 C/km² for Chromium-51, 8 C/km² for Cobalt-60, 4 C/km² for Zinc-65, and 2.9 C/km² for Cesium-137. Below Bolshoy Balchug the level of sediment pollution was much lower, close to the background level for the area below Lesosibirsk. Depth tests of the

sediment also revealed the virtually equal distribution of long-lived Cobalt-60 and Cesium-137 isotopes to a depth of 15 centimeters.

5. There was a high level of pollution in the algae below the combine dumping site.

6. The main gamma-emitting nuclides found in fish samples were Zinc-65 and Cesium-137. These nuclides were even found in fish at distances of over 600 kilometers from the dumping site.

7. The radioactive pollution zone of the islands and floodplain of the Yenisey River with a gamma-radiation dose above the natural background stretches 500 kilometers down river, beginning at the combine dumping site on the right bank and 50 kilometers down river on the left, and covers an area of more than 1,500 kilometers. The width of the zone is limited by the water line and the high-water mark of the last 30 years.

8. The radioactive pollution levels in the floodplain of the Yenisey River are extremely diverse. Within the first 25 kilometers down river from the source, the level of pollution drops from 41 C/km² (Atamanovskiy Island) to 7 C/km². For the next 500 kilometers the pollution level does not depend on the distance from the source and ranges from 3 to 10 C/km² because of the hydrological features of the river. At a distance of 500-1,500 kilometers from the source, the level of Cesium-137 and Cobalt-60 is under 0.1 C/km².

9. The nuclides with the greatest potential impact on human health in the soil were Plutonium-238, 239, and 240; Cobalt-60; Cesium-137 and 134; Manganese-54; Zinc-65; Europium-152, 154 and 155; Cerium-144; and Strontium-90.

Mikhaylov Dismisses Report of Chernobyl Sarcophagus Cracks

*LD0608214892 Moscow Teleradiokompaniya
Ostankino Television First Program Network
in Russian 1700 GMT 6 Aug 92*

[From the "Novosti" newscast]

[Text] Nearly everyone was staggered by the INTERFAX report that the sarcophagus covering the Chernobyl reactor is disintegrating. Shcherbina, director of the installation covering the Chernobyl station, commenting on the unpredictability of the situation, pointed to the danger of another accident.

In this connection we today contacted Russian Nuclear Energy Minister Viktor Mikhaylov. He stated that he does not believe such information, and said that Ukraine would appeal to Russia with an official request for the joint investigation of the sarcophagus, should the situation warrant: Such agreement does exist. However, no request from Ukraine has so far been made to the Main Department for Nuclear Power [Glavatom]. According to Glavatom specialists' reports, radiation emissions from the cracks in the sarcophagus are within normal levels.

Specialists Claim 'No Changes' in Chernobyl Sarcophagus

*PM1108112192 Moscow IZVESTIYA in Russian
11 Aug 92 Morning Edition p 2*

[Valeriy Yakov report: "No Changes in Sarcophagus. No Reason for New Alarm"]

[Text] Television and the news agencies have excited public opinion in recent days with reports that there is a catastrophic situation developing at the Chernobyl AES [nuclear electric power station]: The 'Encasement' (known popularly as the Sarcophagus) is breaking up rapidly and threatens a powerful radioactive discharge. We requested competent specialists who have direct knowledge of Chernobyl to comment on this information.

For a start it is necessary to say that the information about the explosive situation at the AES did not just appear but can be attributed to specific authors—Chernobyl Ministry leader Yu. Shcherbak and 'Encasement' Center Director V. Shcherbina. Their alarming statements were the reason for a new hullabaloo surrounding the subject of Chernobyl.

In the opinion of Academician Spartak Belyayev, deputy director of the I. Kurchatov Nuclear Energy Institute, it was most likely political motives which were behind the alarming statements which the Ukrainian specialists made, and they are of a ephemeral nature. Their purpose is to draw attention not so much to an actual problem with the 'Encasement' as to its image.

But as far as the real situation at the station is concerned, a group of specialist researchers from the Kurchatov Institute which has been working at the 'Encasement' practically all these past years, asserts: No serious changes have occurred which give grounds for such menacing statements.

I also succeeded in getting in contact with Nikolay Shternberg, chairman of the Ukrainian State Committee for Nuclear and Radiation Safety, who likewise confirmed: Nothing unexpected has happened or is happening at the Chernobyl AES. The problem of the sarcophagus, of course, requires attention and there are enough questions awaiting resolution, but in its present state there is no particular reason for great alarm.

Ukraine Officials Cited on Chernobyl Sarcophagus 'Cracks'

*OW0708184192 Moscow INTERFAX in English
1807 GMT 7 Aug 92*

[Following item transmitted via KYODO]

[Text] Director of the Interregional Science and Technical Center "Ukrytiye" [Shelter] of the Ukrainian Academy of Science, Vladimir Karasik, said in an interview to the KHARKOV-NOVOSTI Ukrainian news agency Friday that he had just "endorsed" a resolution prepared by the republic's Cabinet of Ministers in accordance with which the second power unit of the Chernobyl nuclear power plant will be put out of operation. Its nuclear fuel will be supplied to a special storage facility which "already does not have enough capacity for storing fuel from the plant's first and third units." Therefore, the "Ukrytiye" director explains, the nuclear power plant cannot be shut down completely: the first and third units should be put into operation in order to avoid their freezing and "ensuing predicaments" (possible cooling of the reactors).

At a press conference in Kiev Vladimir Shcherbina, director of the "Ukrytiye" installation, universally known as the "sarcophagus," revealed that the latter was gradually fracturing due to the action of the radioactive elements, nuclear radiation leaking off as a result through the cracks in the sarcophagus. [sentence as received]

In the meantime, Vladimir Karasik, who heads the interregional science and research center "Ukrytiye," maintains that "there are no new cracks in the sarcophagus." He admitted, however, that "during the sarcophagus' construction its airtightness was not attained, which necessitates a more reliable safety warranty." In the meantime, the specialist emphasized, on the basis of the analytical results it was established that nuclear emissions through the cracks in the sarcophagus "do not exceed the standards of an operating nuclear power plant unit."

Anatoliy Panov, executive director of the "Zeleny Svit" [Green World] ecological association, said in an interview to the Ukrainian news agency that the summary area of the sarcophagus' cracks amounts to 1200 square meters. All these cracks, in his opinion, have formed as a result of the atmospheric processes and the action of radiation. Mr. Panov has expressed concern over the so-called "nuclear lobby" influence on the Ukrainian powers that be, adding that no works are carried out at the boiler facility construction site, whereas it is indispensable for shutting down the idle units of the Chernobyl power plant as envisaged by the resolution of the Ukrainian Supreme Soviet on October 29, 1991.

Feasibility of Phasing Out Chernobyl-Style Reactors Questioned

92WN0689C Moscow MOSCOW NEWS in English
No 28, 12-19 Jul 92 p 11

[Article by Leonard Nikishin, MN analyst: "Greenpeace: Payment in Advance"]

[Text] The Chernobyl disaster questioned the further existence of nuclear reactors generating such danger. Despite this, the notorious RBMK [high-power fuel-channel-type boiling] reactors are still running, although the slightest malfunction makes millions of people shudder.

The international Greenpeace organization has been trying to solve the problem of these reactors for some time, with the aim of closing them down. But until now all such attacks have been resisted. Easier said than done: just imagine putting a dozen reactors out of action. How can we solve our energy problems? The country has practically no energy reserves and the approach of the cold season always spells trouble.

Russian nuclear experts assure people that appropriate measures have been taken, the RBMK reactors have been improved and there will be no repetition of Chernobyl. But these assurances are not convincing. Everyone knows about the "triumphal" realities our social life was so renowned for. They would prefer 100 percent guarantees.

Greenpeace recently announced its first victory: the round-table conference arranged last week by the Supreme Soviet Committee for Industry and Power Engineering was a success. At any rate, it was announced at the press conference that Mr. Kalistratov, vice-chairman of the Committee, agreed that the Greenpeace ideas were feasible both technically and economically and that it would be possible to shut down the RBMK reactors in the near future. Spokesmen for the President's advisor on ecology, the Ministry of Ecology and independent Russian experts agreed that the nuclear-free policy of effective use of energy and the new methods of gas and energy production can compensate the loss of

power capacities connected with the closure of RBMK reactors. This acknowledgment is a turning point in Russia's policies.

The head of the Ministry of Atomic Energy press centre poured cold water on the heated discussions: "All this is very interesting, but does it mean that Russia has already agreed to accept the Greenpeace program? Of course we talked, debated... Experts expressed varying opinions. But no one has proved yet that RBMK reactors are dangerous. At any rate the International Atomic Energy Agency (IAEA) does not think so. The government of Russia will study alternative approaches but take the most economical road."

Although Greenpeace champions noted reasonably that the safety of nuclear reactors is not so much an economic as an ethical problem (it is society and not technical experts that decides the degree of risk for life), it is all the same clear that their joy was a little premature. This organization accustomed to Western politicians paying attention to its statements and actions has overrated the auditory capabilities of our government structures. The alternative of Greenpeace to RBMK reactors is a more efficient use of energy and the development of new energy production methods compensating for power losses with Western technical and financial assistance. At the press conference I asked what this means in practice.

Firstly, experts say, demand for energy in the CIS countries will be reduced by ten percent in the next 5 years. Secondly, the lessening of energy losses and the introduction of power saving technologies will help save 35-40 percent of energy in the next 10-15 years. Thirdly, the introduction of highly-effective plants generating heat and energy on the basis of natural gas and the development of small-scale reusable sources of energy.

They have little understanding of us... The country where street lamps are lit long past dawn and where trucks on parking lots belch out exhaust fumes for hours on end will hardly change its habits in the near future. We have heard so many times about "the introduction of highly effective power-saving technologies in the next few years" that it is clear even without the experts that the result of this effort will most likely be the same as that of today's economic reforms. But if we get financial support and new technologies we can start discussions. Again the method of "advance payment:" first the commissioning of gas-turbine plants and only then the closure of RBMK reactors. But so far there are no real joint programs with the West in this direction. "Why haven't you requested money from the European Bank for Reconstruction and Development (EBRD)," they asked. "They would certainly provide financial help for this."

Well, we can reply that we have already forgotten how to drive fast, and it still takes us quite a time to harness the horses...

Chernobyl's Trace in Carpathians

927F0252A Kiev UKRAYINA MOLODA in Ukrainian
No 10 Jul, 92 p 4

[Article by Roman Fabryka]

[Text] Commissioned by Ukraine's Minchernobyl, specialists of the Ivano-Frankivsk Geophysical Expedition are inspecting villages in the Bogorodchanskyy, Tisminytskyy, Tlumatskyy, Nadvirnyanskyy and Rozhnyativskyy rayons, where suspicious radiation spots have been detected.

According to information given to an UKRINFORM correspondent at the oblast civil defense headquarters, there are now 77 villages in the Ivano-Frankivsk oblast where the density of territory pollution with radionuclides is one to five curies per square kilometer. Results of inspection of six rayons conducted by dosimetrists of production association "Spetsatom" have been sent to the Ukraine Supreme Soviet for deciding on monetary compensation to the population residing in the affected territories.

Norway To Aid Safety Modifications at Kola Nuclear Station

PM1808140192 Moscow PRAVDA in Russian
18 Aug 92 p 1

[Report by Aleksandr Khramtsov: "Norwegians Nearer, Therefore Kinder"]

[Text] While the "Big Seven" and the IMF think about whether to give Russia the promised billions, the Norwegian government has allocated 20 million kroner from the state budget for the joint project to improve radiation and nuclear safety at the Kola nuclear power station.

Researchers Invent Method To Prevent Underwater Nuclear Contamination

LD0308110492 Moscow ITAR-TASS in English
0912 GMT 3 Aug 92

[By ITAR-TASS correspondent Veronika Romanenkova]

[Text] Moscow, August 3 (TASS)—Russian researchers worked out a method to prevent underwater nuclear contamination, Vladimir Slutsker, vice president of the joint venture "Sitek," told TASS on Monday. The "Sitek" firm holds a patent on the know-how.

According to Slutsker, researchers created a modified chitozan substance (a biopolymer obtained from the material which crabs use in "building" their nests) to blockade radionuclides.

After chitozan is blended with algenic acids obtained from seaweeds, the new jelly-like material is placed into capacities. Under the impact of salt and calcium in the sea water, it instantly sticks and becomes resilient as

rubber. The material completely prevents any nuclear leakage. In addition, it is waterproof and cannot be washed out by the current.

The U.S. Patent Bureau is considering the invention, said Slutsker. He explained the world's acknowledgement will help arrange international works to prevent ecological disasters which may happen as a result of regular nuclear outshots into the ocean.

Slutsker named the U.S. as a possible partner as it is the only country to have the "Global-Challenger" ship making it possible to conduct such works.

Probably, the new method will be used to prevent nuclear contamination on land as well.

Blue Cities That Have No Name; Here People Live in Radioactive Homes

927F0290C Moscow KOMSOMOLSKAYA PRAVDA
in Russian 14 Aug 92 p 2

[Article by B. Vishnevskiy, KOMSOMOLSKAYA PRAVDA correspondent]

[Text] It is windy and hot here, and there is a rural peacefulness. Boys are tending the sheep. An elderly woman is weeding the vegetable garden. Silence. Only the destroyed arch of the church makes a whistling sound.

Perhaps there never was anything here? However, the archives remain. Some have even been published in Atomizdat [Atomic Publishing House]. It is not hard to recreate the terrible secrecy in which the special convoy traveled along the Kama. The convoy was moored at Tikhie Gory and off-loaded. Forty-seven years later, this place (the former Bondyuga) would be called by the name Mendeleev. A quarter of a century later, an orange symbol for radioactive danger would appear on a special map.

However, back then, in May of 1920, only a dozen individuals who "weren't talking" knew about the contents of the holds.

From the report of I. Bashilov, empowered by the Council of People's Commissars to organize the test council factory: "All the work planned by the All-Union Council of National Economy and the Academy of Sciences had to be started all over again, since there were no traces of the work that had been done except for radioactive residues which were obtained by a method unknown at the time..."

This is how history dealt with the Tikhie Gory. Instead of undying glory, the discoverers left the next generation with an ineradicable radium trace. As early as one and a half years after the Kama forced march, V. Vernadskiy reported: "I am happy to inform the Academy that the employees of the Radium Institute under the management of V. Khlopin have succeeded in obtaining the first samples of radium..." In order to extract one precious

gram, up to 350 tons of raw ore had to be processed. A restrained V. Khlopin complained to V. Vernadskiy about the completely "barbaric working conditions."

No doubt, he meant the chronic shortage of workers and fuel, and equipment and reagents. The Volga drought of 1921, mass famine and then the interrogations and arrests... On the whole, there were no other conditions except "barbaric" ones.

At the beginning of last year, V. Bol'shov, an employee of the Kazan Geological Non-Metallic Minerals Scientific Research Institute, brought a rare book to the republic's committee on environmental protection. Two hundred pages entitled "How They Mined Soviet Radium," were swallowed up faster than a detective novel. That very first night, R. Sayfutdinov, the main specialist of the radiology committee, worked himself to the bone copying notes from the book and composing a search map.

A building materials shop ran continuously at the site of the former radium factory. The "whole region and vicinity" was known for decades as consumers of the short-supply brick.

At first, the inhabitants of Tikhie Gory were amazed to see how some strange individual was scouring along the steep, snowy slope. Then he was in neighboring Mendelevsk, wandering along the streets and the unobtrusive brook Toyma. What does it mean to "do a walking survey of gamma radiation?" It means to comb the area suspected of contamination, centimeter by centimeter. Three dosimeters should be used just to be sure. One of them is attached to a leg, and the other two to the waist and an arm. The archival materials would really come in handy about now! However, not one organization, from the Radium Institute imeni V. Khlopina of the Saint Petersburg Scientific Production Association, to the local retainers of information, seriously answers these inquiries. It is as if there has never been a radium factory in Mendelevsk.

With the first act on February 13, 1991, dozens of hot spots of gamma radiation were registered. The degree of contamination is up to thousands of microroentgens per hour (recall that the general background varies from 7-15 microroentgens).

After February, the period of great agreements began. It took the radiological service of the Health and Epidemiologic Directorate one and a half months to get out to the "hot spot." Plus, it took many weeks to examine the reports of Sayfutdinov, that disturber of the peace. The more the joint work uncovered, the more strained Sayfutdinov's relationship became with his colleagues. Then the "individual of doom and gloom" was no longer picked up by the official transport at all.

Of course, it is bad when personal dislikes get mixed up with a matter of national importance. Well, is it possible the official confusion has contributed to this? When

radiology is being handled by the Health and Epidemiologic Directorate, and the State Committee on Environmental Protection (GKOP), and the newly formed business "Geologic Exploration,"... Rumors are being spread that a unified center for radiation safety at the office of the president of the republic is being organized. However, as they say, sooner said than done...

This does not mean that those who knew, signed and kept silent should be stigmatized. Or what about the others, who delayed when it was no time for delaying. As is the custom with us, their lack of responsibility was always compounded by a child-like naivete of another, different group. This group did not know, but only believed. In the 1960s, the clock faces at the Chistopol clock factory were covered with a life-threatening compound of radium-mezatorium. In their proletarian trusting way, the people treated this compound like one of their own. They painted their beds at home and their chamber pots. The most venturesome even used them on their teeth. So let them glow in the dark. Just like the Chistopol watchmakers, there were few who had enough sense not to wait for their own Sayfutdinov. Shake up the "sources" at your own initiative.

Unfortunately, this is the exception. The rule is total ignorance toward the atomic age. Soldiers strip their terrible army weapons for demobilization. They unscrew the pretty trinkets which, if they had a dosimeter, would cause the needle to go right off the meter. Pacemakers which use radioactive elements come to the hospital, without a briefing being given.

I think that lack of knowledge, which is a source of "psychological contamination," is more dangerous than the radiation itself. Many of us have only "heard for whom the bell tolls." In addition, many of my acquaintances are afraid to enter the Kazan university building where "scientists worked under the guidance of I. Kurchatov" during the war. They are also afraid to drive to the Spaskiy region where, they have heard, "liquid waste from the neighboring Dimitrovograd" is pumped into the soil. They are totally afraid to buy meat because it is "from Chernobyl."

Who spreads these fears? I do not know. I asked M. Minniyarova, the chief of the occupational health division of the state Committee of the Health and Epidemiologic Directorate about the health of the inhabitants of Mendelevsk and the neighboring Tikhie Gory. She is not a radiologist at all, but answered: Everything is all right, no one has complained. Then she listed a number of measures confirming this.

In general, this trip is remembered with sadness. The boys who tend the sheep are on the hillock. The old woman is still tending the weeds. It was windy and hot there and peaceful like the country.

Reactor

In Tomsk today, the third reactor of the Sibir' Chemical Combine which produces plutonium for weapons was shut down. The reactor was started up on July 14, 1961. The reactor had exhausted its service life. It is thought that 10 percent of the specialists operating the reactor will lose their jobs.

Kazakhstan Radioactive Dumps Increasing*PM1308083392 Moscow IZVESTIYA in Russian
11 Aug 92 Morning Edition p 1*

[Oleg Stefashin report: "Radioactive Dumps Growing in Kazakhstan"]

[Text] Karaganda—Improvised dumps of radioactive waste have begun to grow in Kazakhstan due to the lack of special burial facilities.

They are appearing like mushrooms after the rain, in most unexpected and sometimes populous areas, moreover, on the outskirts of cities and even in apartment block courtyards. Although the radioactive "waste" most frequently comprises used industrial instruments or components containing powerful sources of ionizing radiation, this by no means reduces the danger inexorably looming over people.

Here is what V. Slavgorodskiy, head of the Kazakh Ministry of Ecology and Bioresources Radiation Ecology Directorate, said at a scientific and practical seminar on problems of radiation ecology and radiation security.

"The radiation situation in the republic is extremely alarming and is continuing to deteriorate. Whereas previously we had virtually no problems with radioactive waste burial installations—the waste was taken to Chelyabinsk, Krasnoyarsk, and Zagorsk—now we do not know what to do with it. Russia is refusing to accept the dangerous freight and we do not have any so-called burial facilities of our own."

Kazakhstan's only radioactive waste burial site is situated near Alma-Ata and belongs to the Institute of Nuclear Physics. But its structure is in breach of one of two main safety conditions—that it be watertight—and, in scientists' opinion, it cannot be used. Naturally enterprises that have lost the opportunity to destroy the contaminated waste themselves are dumping it just anywhere, and the special services do not always succeed in finding it.

At the moment, regrettably, you get the impression that this problem is not frightening anyone very much apart from scientists. Judge for yourselves. Back in 1979 the Kazakh Council of Ministers adopted a special resolution on building burial centers for radioactive waste in five oblasts. But the resolution was simply not carried out.

Only Tselinograd Oblast embarked on the construction of a burial facility and work here was subsequently stopped in response to demands from an enraged public. The upshot was that the virtually complete installation was handed over to an organization that decided to use it to store potatoes.

In March 1990 the republic's Council of Ministers made another attempt to set up its own network of burial facilities. However, this too proved abortive as it "failed to win support at local level."

It is strange that a population frightened by the danger of radiation is actively protesting at the construction of burial installations, completely forgetting that radiation sources scattered all over the place present far more of a threat to them. The result is that radiation phobia is increasing in Kazakhstan and, along with it, the number of ad hoc dumps.

According to specialists from the Radiation Ecology Directorate, contaminated "waste" with a total yield of more than 200,000 curies has already piled up in the republic, which, as you know, contains major production units extracting radioactive raw materials. This is almost 70 times above the designated norm, and it is easy to see that this may disrupt the ecological balance at any minute.

The Kazakh Government cannot be said to have reconciled itself to this state of affairs. L. Artseva, chief specialist at the republic's Gosekonomkomitet [State Economic Committee], said that the Ministry of Ecology and Bioresources has formulated another program for the construction of burial installations. This has been approved by the Cabinet of Ministers, but it is unclear whether it will be implemented.

Radioactive Lake in Southern Urals To Be Eliminated*OW2508142392 Moscow Central Television First
Program and Orbita Networks in Russian 1855 GMT
23 Aug 92*

[S. Sergeyev video report; from the "Utro" program]

[Text] [Sergeyev] In former times, this small lake in the southern Urals was rich in fish and fowl, but during the last 40 years it became a dumping site for the chemical combine Mayak, which is the world's largest manufacturer of weapons-grade plutonium. Lake Karachay has now been turned into the world's worst depository of harmful, long-life radioactive nuclides. Here the radiation is measured in excess of 120 million curie, which is two and a half times greater than at Chernobyl. Military projects are being curtailed, and for several years now work has been under way to eliminate the dead lake. [video shows lake; bulldozers; trucks depositing rocks and concrete blocks into the lake; what appears to be personnel taking radioactivity measurements on the lake shore; and an interview with an unidentified worker]

[Begin video recording] [Unidentified worker] More than two-thirds of the lake's volume has been filled, and a little less than 14 hectares is all that remains. We are carrying out this project pretty intensively because it is an acute ecological problem. The neighboring region must be secured against possible influence by this lake.

[Sergeyev] So, you fill the lake with rocks and hollow ferro-concrete blocks. But where does the deadly water go?

[Worker] First, the water contains about a thousand times less radioactivity than the bottom sediments and silt which have accumulated here. Therefore, the main task is to cover these silt deposits—which contain 95 percent of all radioactive nuclides—with the hollow blocks. As for the water, it partially remains in the landfill and partially evaporates. Eventually this place will become a green glade. We will add a layer of gravel, then a layer of clay, then a layer of fertilizer, and finally grass. However, this glade will remain under strict protection and control for many years.

[Sergeyev] Are there any problems in completing this project of eliminating Lake Karachay?

[Worker] There are problems. One is financial, since our own enterprise is funding all the work of eliminating Lake Karachay. These funds are not enough. Therefore, centralized funding is necessary.

[Sergeyev] Your drivers are performing work which is both difficult and dangerous. What are the bonuses?

[Worker] The drivers' bonuses include a 36-day holiday, retirement at age 50, additional food vouchers, and a salary of 2700 rubles. [end video recording]

[Sergeyev] Today this is not really a great reward for such work. The state should assist these people and the Mayak combine in eliminating the dangerous reservoir. After all, until quite recently the state did participate in speeding up military projects which contributed to the spread of radioactive pollution over tens of kilometers. Now, the death of Lake Karachay must be speeded up.

Nuclear Waste Burial Site Planned for Novaya Zemlya

*PM1808125192 Moscow KRSNAYA ZVEZDA
in Russian 18 Aug 92 p 3*

[Captain Second Rank Vladimir Gundarov report under the "Direct Line" rubric: "New Burial Site on Novaya Zemlya. Specialists Consider It Safe. Oblast Soviet Thinks Differently"]

[Text] Murmansk, 17 Aug—The Moscow Scientific Research Planning Institute of Industrial Technology has prepared draft specifications for the construction of a radioactive waste burial site on Novaya Zemlya. The draft is now undergoing state expert analysis, which is being carried out by specialists from the Ministry of Ecology and Natural Resources, the Ministry of Atomic Power Engineering and Industry, and the Ministry of Health, as well as a number of other organizations and departments responsible for the safe burial of radioactive waste.

In the opinion of A. Mikhaylov, Murmansk Oblast chief radiologist, the first major practical step has been taken toward resolving the problem of the permanent burial of hazardous waste. The burial site planned for Novaya Zemlya meets all the main IAEA [International Atomic

Energy Agency] requirements for structures of this kind. According to specialists it guarantees the safe and virtually permanent burial of radioactive waste. But a considerable quantity of radioactive waste has already accumulated at the long-term storage sites and continues to grow year by year. The main suppliers of radioactive waste are ships and submarines of the Northern Fleet equipped with nuclear power plants, nuclear icebreakers of the Murmansk Shipping Company, and the Kola nuclear power station.

It is proposed that the project, which has the specialists' approval, be submitted to the public for extensive discussion. In that event, however, given the sharply negative attitude of Arkhangelsk Oblast Soviet deputies to the very idea of building a hazardous installation on their oblast's territory, it might not be the scientists who have the final say...

German Specialists To Study Russia's Radioactive Contamination

*LD1708183792 Berlin DDP in German 1128 GMT
17 Aug 92*

[Text] Bonn (DDP)—The Federal Republic will support Russia this year and next year in the investigation of radioactive contamination of the Ural region with humanitarian aid to the tune of 3.3 million marks. On 18 August German radiation protection experts will travel on a Russian transport aircraft to Chelyabinsk in the Urals with a measurement vehicle with several radioactivity measuring devices, announced the Federal Environmental Ministry in Bonn today. Environmental samples and food in the region, where a serious accident took place in 1957 during the production of nuclear weapons, are to be investigated for radioactive contamination.

The situation with regard to the health of the people in the region is bad, according to the ministry's information. They are the third generation to live in the radioactively contaminated environment.

Map Confirming Russian Arctic Nuclear Dumping Received

*PM1008135292 Oslo AFTENPOSTEN in Norwegian
6 Aug 92 p 19*

[Sveinung Berg Bentzrod report: "Twelve Reactors Were Dumped in the Sea"]

[Text] Russian dumping of nuclear reactors off Novaya Zemlya could have serious consequences for Norwegian fisheries. It has been confirmed that a total of 12 reactors, several containing fuel, were dumped in the years leading up to 1982.

With the information which the so-called Barents group has received from Russia and which the NRK Dagsnytt program reported on yesterday morning, the claims of Norwegian and Russian environmental organizations and of Russian newspapers and politicians over the last

few years have finally been confirmed. The nuclear reactors come from submarines and icebreakers, and the majority of them were dumped east of Novaya Zemlya, in the Kara Sea. Of the 12 reactors three still contain fuel—or uranium—and all these are said to have been dumped in the Kara Sea.

Director Knut Gussgard of the State Nuclear Inspectorate, Foreign Ministry Assistant Secretary Torbjorn Norendal, and Environment Ministry adviser Magne Roed—all members of the Barents group—have received a preliminary map from Russia. The map shows the places where the reactors were dumped and the dates of the dumpings. The group, which returns to Norway today, has been the advance party for the main Norwegian expedition which will travel to Russia later this month. The State Nuclear Inspectorate is confident that the map covers all the dumpings of reactors that have taken place, but is unwilling to reveal which bodies prepared the map.

State Nuclear Inspectorate adviser Erling Stranden was concerned to play down the health consequences of the dumping. He thinks it unlikely that the reactors which contain uranium could be started up again where they are lying. The remaining traces of radioactivity in the

reactors will either collect in the mud on the sea bed or be dispersed by ocean currents.

Neither this radioactivity nor the low-level radioactive waste in thousands of containers which are said to have been dumped in the same area in the years leading up to 1986 represents any danger to the fish in the area. The doses which could come into contact with the sea water are too small and the quantity of water too great. But the fish could absorb enough to show up in measurements, and as a result the skepticism in the market place will automatically be there, Stranden said. At worst the negative publicity could have major repercussions for Norwegian fishing interests.

The reactor dumping which has been given the broadest coverage in the Western press took place in the early seventies when the reactor from the icebreaker Lenin was dumped off Novaya Zemlya. The reactor had long been useless as a result of an accident, but it did contain uranium.

In addition to radioactive waste from submarines, icebreakers, and land-based installations, there is also waste that is transported along the Ob river system and radioactivity from nuclear testing, which will be of central interest to the main Norwegian expedition to the northern regions.

Effectiveness of Scientific Studies on Forecasting Oil and Gas Content in Ukraine

927F0313A Kiev NAFTOVA I GAZOVA
PROMYSLOVIST in Ukrainian No 3, 1992
(manuscript received 7 Apr 92) pp 4-6

[[Article by M.M. Ivanyuta, M.Ya. Vul and D.I. Chuprynin (UkrDGRI); first paragraph is the article summary; UDC 553.98.041(477)]

[Text] The experience of scientific studies on forecasting the oil and gas content in Ukraine is analyzed. At present the research is not systemic; it has been conducted on regional, zonal and local levels. Ways for improving the effectiveness of forecasting studies are examined, as well as their effect on the success rate of oil and gas prospecting.

Studies on forecasting the oil and gas content have been conducted at UkrDGRI [not further identified] since the early 1950's, and it acquired the most specific form in computing Ukraine's forecasted resources. Later this work was perfected, and at present it is a system of studies on regional, zonal and local levels.

A regional forecast includes qualitative and quantitative assessment of the oil and gas content prospects, which is conducted at UkrDGRI every 5 years, as well as studies of theoretical problems of oil and gas geology, which are mainly the prerogative of academic institutions (Ukraine IGGGK [Geology and Geochemistry of Combustible Materials Institute] and IGN [Geological Sciences Institute]). These studies form a foundation for long-term planning of regional geological and geophysical work.

Since 1984 UkrDGRI has been providing a zonal forecast of the oil and gas content. The forecast is based on a systemic approach using all types of studies that yield useful information for specific geological conditions. According to this forecast our goal is to improve the effectiveness of prospecting, define its direction and support studies based on a local forecast. As a rule the work results in making recommendations on conducting seismic studies and parametric drilling.

A local forecast of the oil and gas content is a preliminary determination of prospects of a specific site that completes a forecasting research cycle. Its result is an assessment of prospective resources of category C₃, which forms the basis for making a decision to start exploration drilling at the site. At first these studies were conducted at UkrDGRI, then by associations' subject-oriented parties, and since 1990 - again at UkrDGRI.

By the end of 1991 zonal forecasting had been completed for 87.5% of the total area of the Verkhnyovizeysko-Serpukhovskiy Complex of the Dnieper-Donets Depression (DDD), 8.6% of the Nyzhnyovizeysko-Turneyskyy Complex and 20.9% of the Serednyokarbonovyy Complex. Sixteen zonal forecasts in the West and seven in the South region were made, which covers 80 and 65%, respectively, of prospective complexes and territories. As

a result of these studies in the DDD a methodology for forecasting sand bodies in reservoirs pinching out on monocline slopes was proposed, and directions for prospecting for deposits in traps with complex configuration ("cord"-type, micrograbens, cut-ins and wedged shapes) were substantiated. For the Western region it was recommended to assess prospects of lithological traps in Mesozoic deposits of the Bilche-Volytska zone (parametric well 1-Grynivka); prospect for anticlinal traps southwest of the Rozhen-Lopushna-Petrovets line in the strip of development of increased thickness of Paleogenic and Cretaceous formations under the Pokutsko-Bukovynski Carpathians thrust (parametric well 1-Selyatin); and assess prospects of paraautochthone of the Carpathians Krosnenska and Skybova zones (parametric wells 1-Grynivka, 1-Brusturanka and 1-Zhornava). In the South it was proposed to work on assessing the oil and gas content of the upper Cretaceous, carbonate, low Cretaceous terigenous and upper Jurassic-Beriasic reefogenic complex of the Kerch peninsula.

As a direct result of zonal forecasting in the DDD over 80 non-anticlinal traps have been delineated. Exploratory drilling is being conducted in some of them - the Andiyashevsko-Goncharenkivskyy prospective node, Dovgalivska, Zakhidno-Zymnytska and Zakhidno-Aleksynska areas, and Larynsko-Ignativska prospective zone. A model of traps connected to upper vise reservoirs that pinch out at the northern monocline slope of the Srebnenska depression has been developed. The discovery of the Savinkovske field and deposits in the Zymnytska area are the most convincing examples of the expediency of forecasting studies in the DDD.

In the Western region the Mykulychynske oil field in the Boryslav-Pokutska zone and gas deposits in the Krosnenska zone Oligocene beds in the Grynivka area were discovered on sites substantiated by the zonal forecast. The latter discovery indicates good prospects for exploration in paraautochthonic regions of the Carpathians.

In the Southern region the Zhovtoyarske oil field, Povortne gas field and the Stepova region of the Tetynivske gas field had been discovered the same way. For the South-Western Crimea a paleogeographic model of the Titon-Berias reef structure on a palinspastic foundation has been developed. The substantiation of the idea of throw-folding tectonics in the Kerch Peninsula geosynclinal complex is an important result of the zonal forecast.

A characteristic feature of a local forecast of oil and gas content at the current stage is a high level of integration, which is realized at UkrDGRI by consistent analysis of validity of seismic structural constructions, which stipulates verification of seismostratigraphic correlation and parametric support of aimed reflections, site geometrization, and determination of the most probable genesis of a trap, and the closest explored analog in order to use its design parameters. A system of site ranking criteria in order to select the most promising among the sites that had been identified and prepared for further exploration

was determined for each Ukraine region. This made it possible to recommend for including in the fund only 24 out of 27 structures prepared in the DDD, including 21 structures for exploration drilling, with only 11 of those assigned the first priority. In the West it was recommended to include in the fund 15 of 16 structures, 12 of them for exploration drilling, and only three of them have been assigned the first priority. In the South only five structures have been delivered, and only two have been recommended to the fund, but none was assigned the first priority.

The multifactor analysis method for identified structures yielded the following results: as of January 1, 1992, 32 out of 126 Ukraine structures were recommended as first priority for preparation, including 25 in the DDD and seven in the West. In the South none of the analyzed structures was assigned the first priority.

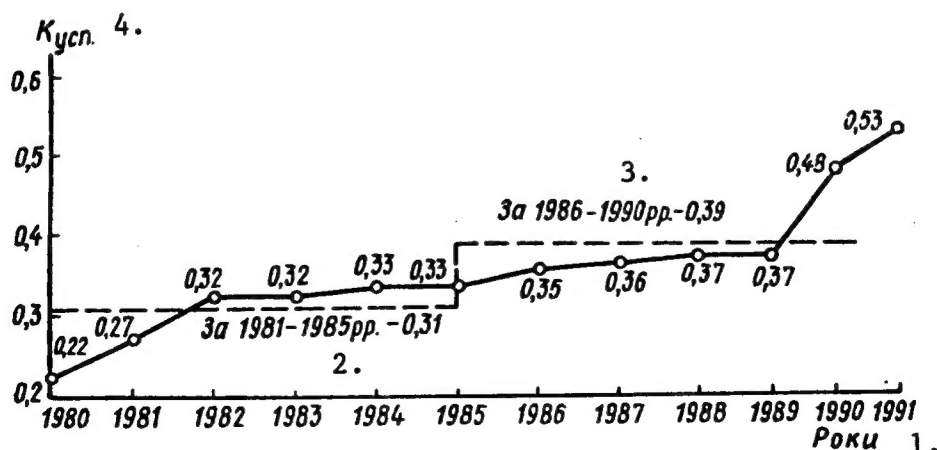
An objective indicator that characterizes the effect of forecasting studies on the effectiveness of geological prospecting is the coefficient of prospecting success. Its dynamics in 1980-1991 is shown in the figure above. It is quite obvious that its increase in Ukraine from 0.31 in 1981-1985 to 0.39 in 1986-1990 is no accident; in our opinion, it undoubtedly attests to the usefulness of forecasting studies. But results obtained from forecasting studies could be even better were it not for a number of bottlenecks—first of all, slow implementation of recommendations, second, methodological drawbacks, and third, organizational and financial shortcomings. As overcoming them is the main reserve for increasing the effectiveness of forecasting studies, we shall dwell on their analysis in greater detail.

Sometimes recommendations that follow from zonal forecasting studies are implemented extremely slowly. Also, results of a local forecast are implemented insufficiently. Thus, when putting together the 1992 structure preparation plan, the principle of ranking sites based on results of the multifactor analysis, which had been proposed by the Institute, was not fully utilized.

"Methodological Guides..." for local and zonal forecasts approved in 1986 by the former Mingeo USSR [the UkSSR Ministry of Geology] affected positively the overall quality of forecasting studies. But experience demonstrates that methodological foundations of a local forecast need to be revised and improved. First of all, this is the question of greater use of seismic prospecting and developing ways for integration of methods for geological and geophysical forecasting in the interwell space. It has also turned out that the "Methodological Guide on a Zonal Forecast..." is not fully universal for various regions. In particular it does not take into account the specific character of forecasting in carbonate complexes and the scale of manifestation of secondary lithological transformations of terigenous reservoirs (silicification, compaction etc.), and there are no criteria for zonal forecasting for the conditions of the DDD foundation. It has no provision for using results of decoding of aerospace photographs. In our opinion it is expedient to create a general document for substantiating the direction of geological prospecting with simultaneous coverage of the entire prospective area of a section. Also it would probably be necessary to supplement the list of recommended studies with propositions on exploration drilling.

The main organizational shortcoming is that after the Institute switched to cost accounting and then to market relations, the studies began losing their integrated character, and links between individual groups of the collective that work on various sections of a forecast have weakened. People working on these assignments view them as superficial, because they perform them outside the financial program of scientific research work. Incidentally, in organization of studies on local forecasting at the current stage this drawback has been overcome precisely by using a successful financing method.

In 1992-1995 it is planned to continue the work at all levels of forecasting. Forecast resources of hydrocarbons will be reassessed as of January 1, 1993. Studies on zonal forecasting will continue. They will be repeated for



Dynamics of Coefficient of Success of Oil and Gas Field Prospecting in Ukraine in 1980-1991

Key: 1. Years; 2. 0.31 in 1981-1985; 3. 0.39 in 1986-1990; 4. Success rate

certain sites. A local forecast will be accompanied by geological and economic assessment of category C₃ resources, which must substantially increase the level of justification of decisions on putting prepared sites to exploration drilling. In order to improve the methodological basis of a zonal oil and gas content forecast it is planned to compile a new methodological guide taking into account the accumulated experience.

In order to improve the effectiveness of geological prospecting we deem it necessary, along with other measures, for State geological enterprises to conduct annual reviews of the status of implementation of recommendations that follow from forecasting studies.

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